Learning Disabled Students at a Highly Selective Liberal Arts College: How They Make it Work

by

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Abstract

Though learning disabled students have become increasingly present in selective postsecondary institutions, very little is known about who they are or how they cope with academic challenges. This study found that the learning disabled students attending this highly selective university had particularly high verbal capabilities despite having deficits in working memory and processing speed. These students seemed to manage their academic challenges by making global accommodations such as selecting manageable course loads or allocating extra time for academic work, as opposed to choosing other, more specific strategies, the use of which varied greatly from person to person. Data is also presented on the association between strategy use and the students' cognitive deficits that may help inform later research.

Introduction

As continuing schooling after the secondary level becomes more and more typical for students in the United States, the population of college students has broadened to include people for whom obtaining a postsecondary education used to be implausible. One particular population that has recently entered the higher education world in large numbers is the learning disabled (LD) population, with rates increasing steadily over the last three decades (Alster, 1997; Henderson, 1995; Henderson 1999; National Center for Educational Statistics, 2006; National Longitudinal Transition Study-2 [NLTS2], 2005). According to data collected by the National Center for Educational Statistics, as of 1995, nearly 50,000 students with learning disabilities started college each year, constituting nearly 3% of all first year students (National Center for Educational Statistics, 2006). This was a 30% increase from 1985 when only 1.1% of all first year full-time freshmen were LD. Further, by 1998, two in every five freshman with disabilities attending a full-time college or university reported a learning disability, making this the most common disability among students in a college or university setting (Henderson, 1999). Additionally, as of a recent study by the U.S. Department of Education, 12.8% of students who currently attend either a two-year college or a community college and 8.7% of students who attend a four-year university have learning disabilities (NLTS2, 2005).

Though the definition of what constitutes a learning disability varies from state to state, the National Joint Committee for Learning Disabilities (1983) defines a learning disability as

> …a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading,

> writing, reasoning or mathematical abilities. These disorders are intrinsic to the individual. Even though a learning disability may occur concomitantly with other handicapping conditions (e.g., sensory impairment, mental retardation, social, or emotional disturbance) or environmental influences (e.g., cultural differences, insufficient/inappropriate instruction, or psychogenic factors), it is not the direct result of those conditions or influences…." (p. 43-44).

As this definition suggests, learning disabilities encompass a diverse group of disorders. In the DSM-IV, the category of learning disabilities includes such disorders as Reading Disorders (the most common diagnosis according to the President's Commission on Excellence in Special Education, (2002)), Mathematics Disorders, Disorders of Written Expression, and Learning Disorder Not Otherwise Specified.

Among those students who complete high school and go on to college, research suggests that LD students find the academics involved in postsecondary schooling more challenging than non-learning disabled (NLD) student find such programs. LD students seem to gravitate toward nontraditional learning environments, attending vocational and other non-collegiate postsecondary programs at a higher rate than NLD students (Murray, Goldstein, Nourse, & Edgar, 2000) and enrolling in two-year/community colleges more than four-year colleges (NLTS2, 2005). Murray, Goldstein, Nourse, and Edgar (2000) found that five years after high school, the graduation rate of college students (including those attending vocational, community, and four-year colleges) with LD was 56% as compared to 80% of NLD students. Moreover, although some research suggests that the trend may be changing, (Heiman & Precel, 2003; Trainin & Swanson, 2005), historically those LD students who did graduate often achieved a lower grade point average (GPA) as compared to NLD students (Vogel & Adelman, 1990, 1992). Vogel and Adelman (1990) found

that LD students' GPA at the end of their time at a community college (whether due to graduation, dropping out, or transferring from the college) as well as their GPA at the end of each individual year of study was significantly lower than that of NLD students at the same community college. In addition, Vogel and Adelman (1992) found that LD students were at a higher risk for failing their courses than NLD students, suggesting that LD students were less able to cope with their academic challenges than NLD students.

The main deficits believed to characterize LD students are a deficient working memory (e.g., Gathercole, Alloway, Wilis, & Adams, 2006; Gathercole & Pickering, 2001; Henry, 2001; Siegel & Ryan, 1989; Swanson & Ashbaker, 2000; Swanson & Sáez, 2005) and slower processing speeds (e.g., Calhoun & Mayes, 2005; Weiler, et al., 2000). Working memory, as described by Baddeley (1986), is a memory system that temporarily stores and manipulates information to allow for the potential processing of that information into long term memory. Usually working memory is modeled as a three part system: a phonological loop, which processes and stores verbal information, a visuospatial sketchpad which processes and stores visual and spatial information, and the central executive which meditates the brain's resources between the other two systems as well as facilitating other higher level or complex processing. Processing speed is the speed at which one can execute basic cognitive processes (Kaufman & Lichtenberger, 1999). It is well established that working memory is crucial to learning new material, and that processing speed plays a large role in allowing students to better utilize their working memory which contributes to students' ability to succeed academically (e.g., Chang, 2004; Fry &

Hale, 1996; Gathercole & Pickering, 2000; Gathercole, Wilis, Emslie, & Baddeley, 1992; Henry, 2001; Jensen, 1993; Just & Carpenter, 1992; Kole & Healy, 2007; Kyllonen & Christal, 1990; Michas & Henry, 1994; Miller & Vernon, 1996; Rindermann & Neubauer, 2004; Swanson & Sáez, 2005).

In order to help compensate for these cognitive deficits, official accommodations are provided by colleges and universities to students with documented learning disabilities according to the guidelines established by Section 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act of 1990. An official accommodation is defined as any change that is made to the format or administration of a test or assignment that enables a more accurate interpretation of competence than the standard version would allow (Sireci, Scarpati, & Li, 2005). Though the specific accommodations provided vary from institution to institution, in general, accommodations offered include: extended time on tests, separate testing location free of distractions, use of word processors, scribe to record answers on tests, test reader, alternate version of tests, and modified grading standards to provide leniency on nonessential aspects of assignments such as grammar and spelling (Lindstrom, 2007). According to Alster (1997), Ofiesh, Mather, and Russell (2005), and others, extended time is the most commonly requested and provided accommodation for postsecondary school students with learning disabilities. Other commonly used accommodations include individual or small group test administration, test scribe to record answers, and large print tests (Bolt & Thurlow, 2004).

The findings concerning the effectiveness of official accommodations vary. Many studies suggest that extended time really does help LD students to perform at a level similar to their peers on both standardized tests (e.g., Brown, Bennett, & Hanna, 1981; Runyan, 2001) and general academic tasks (e.g., Alster, 1997; Lesaux, Pearson, & Siegel, 2006; McGuire, Hall, & Litt 1991; Vogel & Adelman, 1992). However, some studies suggest that accommodations may not be helpful for all LD students. Vogel and Adelman (1990) found that LD students score more poorly on the ACT than NLD students even when LD students use modified examination procedures. Similarly, Elliott, Kratochwill, and McKevitt (2001) found that although the use of accommodations had a moderate to large impact on many LD students' test scores, there was a small percentage of LD student for whom accommodations did not benefit testing results. Moreover, Runyan (2001) found that the amount of additional time required to effectively assist individual LD students varied greatly. In a presentation concerning the preparation and transition of LD students to postsecondary school based on the findings of the NLTS2, Blackorby (2006) suggested that although official accommodations often help students with learning disabilities, they "do not fully eliminate students' fundamental problems in performance" (Blackorby, 2006, p. 61). In addition to the controversy over the effectiveness of available accommodations, there is also some question about whether students are provided with the accommodations they need. According to the National Center for Education Statistics (2003), in the 1999-2000 school year 32% of students with learning disabilities or ADHD attending a postsecondary school reported not receiving accommodations. In 2005, the NLTS2 duplicated these findings, reporting

that only 35% of students with disabilities (of whom students with learning disabilities comprised the largest category) received accommodations or support services and Mellard and Byrne (1993) found that even when support services were offered, many LD students did not take advantage of these services. Additionally, the NLTS2 (2005) found that 12% of LD students in postsecondary schools reported not getting enough support services and 11% of the LD sample thought that the services they did receive were not very useful.

Considering the contested nature of the efficacy and availability of official accommodations and the increased trend toward more autonomous and independence based learning (Crux, 1991; Hodge & Preston-Sabin, 1997), it is important to explore the broad range of internal strategies, such as personalizing study methods, monitoring progress, or determining overall work effort, that LD students use to cope with their academic challenges. This area has received far less research attention than that of official accommodations provided by the university to students in the academic environment, and most of the research on internal strategies has focused only on self-regulatory learning and metacognition, the awareness of and ability to select the behaviors needed to accomplish academic goals (Pintrich, Anderman, & Klobucar, 1994; Zimmerman 1986). In recent years, a few studies have begun to try to isolate the more specific internal strategies that LD students use to cope with academic challenges. Most of this information has been presented in the form of practical learning guides complied by researchers and other experts in the field (e.g., Crux, 1991; Ruban, McCoach, McGuire, & Reis, 2003; Vogel & Adelman,

1990; 1992). However, there are few systematic empirical studies that have characterized the specific internal strategies that are used by LD students.

Heiman and Precel (2003) found that LD students were less likely than NLD students to use written strategies, such as summarizing material or making short notes while memorizing material, but were more likely to use "…unusual strategies or tricks, usually not written ones, to help them remember, such as singing or chanting a test, imagining various associations, marking the text in a special way, or making diagrams or sketches…" (Heiman & Precel, 2003, p. 249). They also found that LD students reported preferring non-written explanations of material (e.g., graphs, highlighting, etc.) whereas NLD students preferred written examples. In another study, Heiman (2006) found that LD students reported using stepwise processing strategies, such as memorizing and drilling, more than NLD student did and that LD students reported depending on self-regulatory strategies, such as controlling their learning process, self orientation, planning their work, and monitoring their progress, more than NLD students.

In addition, while exploring the metacognitive strategies of LD students with phonological processing deficits Trainin and Swanson (2005) found that LD students were more likely to seek help, adopt time management strategies such as avoiding cramming and preparing early, and spend more time working than NLD students. They also found that LD students benefited more from high strategy use (the use of a larger number of learning strategies such as rehearsal, critical thinking, organization, and elaboration) than NLD students did. Similarly, while exploring the relationship between motivation and the use of strategies in NLD and LD students, Ruban and

colleagues (2003) found that the use of self-regulatory learning strategies was more beneficial for LD students than NLD students.

Though research has begun to explore the strategies that LD students use to cope with academic challenges and the role that strategy use has on academic success, there do not seem to be any studies that have examined how LD students' cognitive deficits relate to the strategies they utilize. An understanding of the interaction between students' cognitive deficits and the strategies they choose to use to accomplish their academic tasks could help facilitate LD students' transition into postsecondary education. If we are able to determine what strategies are usually used by students with specific deficits, than perhaps we can help students with similar deficits to identify the strategies that they will most likely find helpful.

Additionally, the majority of the studies that have explored the internal coping strategies of LD students have looked at postsecondary schools that are accessible to the average student including an open university in Israel, a school that caters to students who need to approach their learning in a nonstandard way and allows students to enroll regardless of prior scholastic achievements (e.g., Heiman, 2006), community colleges, and other colleges that are known for their high levels of support for their students (e.g., Vogel & Adelman, 1992). As the U.S. Department of Education's recent study demonstrates, more and more LD students are entering four-year colleges in addition to two-year community colleges (NLTS2, 2005). In fact, LD students are also enrolling in higher numbers at those colleges considered to be highly selective. Though there does not seem to be any official documentation regarding LD students' presence at more highly selective institutions, three highly prestigious, small

liberal arts colleges reported enrollment rates for LD students between 2.2% and 4% during the 2007-2008 school year. To date, little is known about the characteristics of these LD students or the strategies they use to cope with the curriculum at these selective institutions. Thus, the present study set out to explore 1) cognitive and demographic characteristics of LD students in a selective university setting; 2) the strategies that these LD students use; and 3) possible associations between strategies of LD students and their specific cognitive deficits.

Method

Participants

Participants in the present study were students enrolled at a highly selective liberal arts college during the 2007-2008 academic year. Those with a learning disability were recruited from a list provided by the Office of Students with Disabilities. The list included students who identified themselves as having a learning disability and whose classification had been approved by the University according to guidelines developed by the Association on Higher Education and Disability (AHEAD, 2004) in compliance with the Americans with Disabilities Act of 1990 and the Rehabilitation Act of 1973 (as amended, 1978). Classification was based on the results of psychological and educational testing administered and interpreted by licensed or certified psychologists. These tests were submitted to the University as documentation of a learning disability.

Students were initially contacted through e-mail by the Associate Dean for Student Academic Resources. Those who were interested in learning more about the

study voluntarily contacted the researcher to express interest. During this contact the study was explained and the participants consented to provide access to their official documentation. Documentation and questionnaire responses were linked by a code that participants were asked to record on their questionnaire. The code consisted of participants' birth date and the last two digits of their school identification number and could be linked to their documentation without sacrificing anonymity.

Those consenting to participate included 32 students with a learning disability (LD) (17 (53.1%) LD only, 6 (18.8%) LD with ADHD, and 9 (28.1%) ADHD compounded by cognitive deficits). Students with ADHD but no learning disability, or with mental disabilities that compounded their learning disability (e.g., Autism), were excluded from the sample. Twelve (35%) students in the final LD sample were female and 20 (62.5%) were male. Twenty six (81.2%) of these LD students characterized themselves as White, 1 (3.1%) as Hispanic, 1 (3.1%) as Asian/Pacific Islander, and the remaining 4 participants (12.5%) characterized themselves as other or multiple races. Ten (31.2%) were seniors, 8 (25.0%) were juniors, 7 (21.9%) were sophomores, and 7 (21.9%) were freshmen. One LD participant was dropped from further analysis based on missing questionnaire and cognitive documentation data.

A comparison group of 29 students (19 females and 10 males) without a learning disability or other cognitive deficits was recruited from the student body at large through e-mail contact by the researcher. These NLD participants included 7 (24.1%) seniors, 4 (13.8%) juniors, 7 (24.1%) sophomores, and 11 (37.9%) freshmen. Similar to the LD group, the majority of the NLD sample self-disclosed as White (21 participants (80.8%)). Of the remaining participants, 1 (3.8%) self-

disclosed as Black, 2 (7.7%) as Hispanic, 1 (3.8%) as Asian or Pacific Islander, 1 (3.8%) as other or multiple races, and three chose not to identify their race. Five NLD participants were dropped from analysis due to missing questionnaire data, and 3 NLD participants were dropped because they indicated that they had been diagnosed with a learning disability in their past or currently suspected that they had a learning disability. In return for their participation, students were entered into a raffle for one of eight $50 monetary prizes.

Instruments

Academic strategies questionnaire. A questionnaire was developed for this study to evaluate the use of academic strategies. This questionnaire included an extensive list of strategies that could be used in a variety of academic tasks. The strategies were compiled from published research on accommodation strategies used by college students with learning disabilities, from guides and brochures created by researchers and educators to help LD students use accommodation strategies, and from peer feedback. The academic tasks addressed were a) taking and organizing in-class notes; b) preparing for lectures; c) completing at home assignments (including problem sets, readings from textbook chapters, articles, and stories or narratives); d) studying for in class exams; e) taking in class exams; f) completing take home assignments (including take-home tests and papers); and g) and overall work habits. Under each task potential strategies were listed and participants were asked to indicate which they used to complete the various academic tasks. Participants were offered space to provide clarification or to indicate additional strategies that were not listed. The questionnaire also requested the student's academic major, grade point

average (GPA), class year and the approximate number of hours per week spent doing extracurricular activities. Additionally, the NLD participants were asked if they had ever been diagnosed with a learning disability. (See Appendix for academic strategies questionnaire given to LD students. The academic strategies questionnaire given to NLD students is identical, with the exception of the aforementioned question).

LD documentation. Individual tests included in the LD participants' documentation varied. However, for all participants the testing included either the Wechsler Adult Intelligence Scale – Third Edition (WAIS-III) or the Wechsler Intelligence Scale for Children – Third Edition (WISC-III). These two tests were used to obtain scores reflecting cognitive performance on verbal comprehension, perceptual organization, working memory, and processing speed, as well as Verbal, Perceptual and Full Scale IQ scores.

WAIS-III and WISC-III documentation also included subtest scores that were compiled into the four index scores. The Verbal Comprehension Index included Vocabulary, Similarities, and Information subtests and, for the WISC-III, a Comprehension subtest. The Verbal Comprehension Index measures students' verbal fluency, verbal reasoning skills, and verbal knowledge. It evaluates students' ability to orally answer questions that measure factual knowledge, word meanings, and reasoning (Kaufman & Lichtenberger, 1999). The Working Memory Index (referred to in the WISC-III as the Freedom from Distractibility Index) included the Arithmetic and Digit Span subtests and, for the WAIS-III, the Letter-Number Sequencing subtest. The Working Memory Index measures the ability to learn new material, hold information in short-term memory, manipulate information, and concentrate

(Kaufman & Lichtenberger, 1999). The Perceptual Organization Index included the Picture Completion, Block Design, and Matrix Reasoning subtests and, for WISC-III, the Picture Arrangement subtest. The Perceptual Organization Index measures students' non-verbal reasoning, problem solving, abstract thinking, visual-spatial and visual-motor skills (Kaufman & Lichtenberger, 1999). The Processing Speeds Index included the Digit Symbol-Coding (referred to as Coding in the WISC-III) and Symbol Search subtests and was used to measure speed of processing, information scanning, and ability to focus attention (Kaufman & Lichtenberger, 1999), Additionally, the Object Assembly subtest was used in the WAIS-III as a substitute for a Performance subtest and in the WISC-III as one of the subtests used to compute the Perceptual Organization Index. The Maze subtest was excluded from the analysis because it only appeared in the WISC-III (refer to Table 1 for the number of participants using each test).

Analysis

Due to the small sample size and exploratory nature of the analysis, significance was evaluated at the $p < .05$ level rather than being adjusted for multiple comparisons. First, Chi Square analyses were conducted to evaluate the difference between LD and NLD participants' academic majors. Differences between LD and NLD students in terms of selected major were examined based on aggregate categories representing Arts, Humanities, Social Sciences, and Natural Sciences and Mathematics[1]. Majors also were categorized according to whether or not the major is

[1] The Natural Sciences and Mathematics category consisted of the following majors: Earth and Environmental Sciences, Computer Science, Chemistry, Math, Biology, Molecular Biology and Biochemistry Program, Neuroscience and Behavior, Premed Path, Mathematics-Economics Program, and Physics. If subjects had two or more majors, and one of them fell into this category they were

reading and writing intensive (writing intensive majors included Government, History, International Relations, Classics, Philosophy, Film Studies, College of Social Sciences, American Studies, English, Feminist, Gender, and Sexuality Studies, Sociology, African American Studies, East Asian Studies, and College of Letters). These groupings were based on descriptions from the university's course catalog. ANOVAs were conducted to evaluate differences between LD and NLD participants' GPAs and average hours spent engaging in extracurricular activities.

When analyzing data on academic strategies, those that were endorsed by fewer than 3 LD participants (~10%) were dropped from further analysis.[2] Strategies that were repeated in multiple parts of the questionnaire were summed into a single variable that represented use of the strategies in any context. For example, highlighting stories and highlighting textbooks were combined into a single highlighting readings strategy indicating if use of this strategy was present in any context. Next, Chi Square analyses were conducted to evaluate differences in the use of each academic strategy between LD and NLD participants.

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classified as a Natural Sciences and Mathematics major. The Social Sciences category included Psychology, Economics, Sociology and Government. If subjects had two or more majors, and one fell into this category and they were not already listed as being a Natural Sciences or Mathematics major, they were classified as a Social Science major. If subjects were majoring in any of the following departments: History, International Relations, Classics, Philosophy, Sociology, Theater, Film Studies, College of Social Sciences, American Studies, Feminist, Gender, and Sexualities Studies, Anthropology, African American Studies, College of Letters, East Asian Studies, or Italian, and they were not already in one of the other major categories, they were classified as a Humanities major. If students were not majoring in any other department and were majoring in Studio Art or Music they were classified as an Arts major.

[2] These strategies included: using tape recordings in anyway (e.g., to record class notes, to study from, to listen to readings, to make comments while reading, to record ideas for papers before writing), taking notes on an electric pad, using file cabinets to organize notes, using drawings or diagrams to demonstrate relationships in readings, verbalizing while reading, trying to answer focus questions while reading, asking test question at the end of readings, using enlarged notes while studying, proofreading papers or essays in steps, having a checklist to help monitor papers for troublesome capitalization, punctuation, grammar, and spelling errors, choosing to write simpler sentences in order to improve grammar in papers, and studying with a private tutor.

To examine cognitive data collected on the LD students, standard methods for interpreting the WAIS-III and the WISC-III were utilized to determine whether abnormal disparities existed within each student's cognitive scores. A Full Scale IQ score is considered unusable if the discrepancies between its components, specifically the Verbal IQ and Performance IQ scores, or the Verbal Comprehension Index and the Perceptual Organization Index, are so large that it is deemed rare enough to be abnormal at a $p < .05$ level. The difference between the Verbal IQ and Performance IQ scores must be at least 17 points to be deemed abnormally different at a $p < .05$ level and the difference between the Verbal Comprehension Index and the Perceptual Organization Index must be at least 19 points.

Both the Verbal IQ score and the Performance IQ score are considered abnormally varied at a $p < .05$ level (and thus not a cohesive measure) if the difference between the highest and lowest subscale scores is larger than 8. This difference is referred to as an abnormally large scatter within the measure. The abnormalities of the Index scores were similarly computed. The Verbal Comprehension Index is considered to be abnormally varied at a $p < .05$ level (and thus not a cohesive measure) if the difference between the highest and lowest subscale scores is larger than 4. The Working Memory Index and the Perceptual Organization Index are considered to be abnormally varied at a $p < .05$ level (and thus not a cohesive measure) if the difference between the highest and lowest subscale scores is larger than 5. The Processing Speed Index is considered to be abnormally varied at a $p < .05$ level (and thus not a cohesive measure) if the difference between its two subscale scores is larger than 3.

Standard WAIS-III and WISC-III interpretation methodology was utilized to determine if subscales demonstrated strengths or weaknesses for each participant. To determine if a subscale is a strength or weakness at a $p < .05$ level, the difference between the subscale score and the participant's mean subscale score was calculated. For participants with a Full IQ score that had an abnormally large discrepancy, the mean subscale scores for verbal subscales were calculated exclusively from their verbal subscales and the mean subscale scores for performance subscales were calculated exclusively from their performance subscales. The difference between the individual subscale and the mean subscale score needed for significance at a $p < .05$ level varied from 2 to 4 points. If the difference reached the level needed for statistical significance and was positive, the subscale demonstrated a strength. If the difference reached the level needed for significance and was negative, the subscale demonstrated a weakness.

Correlations were conducted to explore the relationship between the total number of strategies endorsed and the students' cognitive test scores. Finally, multiple regression analyses were conducted to examine associations between cognitive test scores and the individual strategies that students endorsed while controlling for the total number of strategies used by each student.

Results

Characteristics of LD and NLD Students

LD group status and selected major were not found to be significantly associated (see Table 2), though significantly fewer LD students majored in the

Humanities than NLD students (16.7% vs. 42.0%, respectively; χ^2 = 4.71, df 1, p = .030). When students' majors were categorized by the tasks involved, the overall difference approached significance (χ^2 = 3.66, df 1, p = .056) and the specific association between the number of LD students that were found to major in traditionally reading and writing intensive areas as compared to NLD students was significantly different (41.2% vs. 58.8%, respectively; χ^2 = 3.92, df 1, p = .048). Additionally, LD and NLD students were found to be statistically similar in terms of GPA and average hours spent engaging in extra curricular activities.

Strategy use of LD and NLD Students

Of the 13 official accommodations offered by the university to students who are classified as having a learning disability, 12 were reported to be used by less than 30% of the LD participants and 9 were reported to be used by less than 10% of the LD sample. However, 81.2% of the LD sample reported using extended time on exams, 25% reported using a word processor, and 21.9% reported using separate testing locations (See Table 3).

Table 4 presents strategies used at different rates by LD and NLD students. Out of the 205 individual strategies assessed, 14 were endorsed significantly more often by LD students as compared to NLD students. These included two note-taking strategies (i.e., copying over or reorganizing notes and supplementing notes by comparing them to other classmates' notes), three reading strategies (i.e., identifying key points while doing readings to make review easier, reading all of the textbox features such as charts, boxes, graphs, etc., and changing the way in which material is read when difficulties arise), three study strategies (i.e., making outlines of key

concepts, trying to anticipate test format while studying, and studying by reading over notes and outlines) and three time utilization strategies (i.e., working slowly and monitoring for careless mistakes while doing problems sets, using all of the available time when taking tests and studying in long sittings as opposed to taking many breaks). Finally, LD students were more likely than NLD students to report picking fewer hard courses, ensuring that class work is balanced, and using a folder or portable file-binders to keep class notes organized.

In contrast, only 4 strategies were found to be used more by NLD students as compared to LD students. These included focusing on the harder material first when studying for a test, using symbols or abbreviations to speed up note-taking, reading over papers and essays for spelling and grammar, and following directions precisely. When the total number of strategies was examined, LD and NLD students were found to endorse a statistically similar number of strategies (mean = 104.4 vs. mean = 98.6, respectively, with an overall range of 37-154; see Table 5).

Cognitive Performance of LD Students

Descriptive statistics regarding LD students' cognitive performance are presented in Table 6. LD students' Verbal IQ (mean = 129.45, SD 10.88) was higher on average than their Performance IQ (mean = 113.90, SD 11.58). Standard scores on the Verbal Comprehension Index ranged from 110 to 150 (mean = 133.88, SD 10.97) with the vast majority of students (24 participants or 82.8% of the sample) scoring a standard deviation or more above the mean. Scores on the Perceptual Organization Index ranged from a standard score of 84 to 138 (mean = 118.12, SD 12.41) with 17 students (58.6% of the sample) performing 1 SD or more above the mean and

1 student (3.4% of the sample) performing 1 SD or more below the mean. Average standard scores on the Working Memory Index (range of 93-138, mean = 109.65, SD 11.39) and the Processing Speed Index (range of 79-128, mean = 97.96, SD 13.25) were generally lower than the Verbal Comprehension Index and the Perceptual Organization Index. Three (10.3% of the sample) students' Processing Speed Index scores were 1 SD or more above the mean and 5 were 1 SD or more below the mean (17.2% of the sample). Ten (34.5% of the sample) students' Working Memory Index score was 1 SD or more above the mean and no participants performed at a standard deviation or more below the mean. Nearly all of the participants (23 participants or 85.2% of the sample) had at least a 1 SD difference between their highest Index score (Verbal Comprehension in all but 3 (11.1% of the sample) participants) and their lowest Index score (Processing Speed in all but 7 (25.9% of the sample) participants). Twelve participants (44.4% of the sample) had at least a 3 SD difference, with one participant reaching a 64 point (4 SD) difference between the highest and lowest score.

When calculating abnormal discrepancies within the various IQ scores, 18 LD students (62.1% of the sample) had an abnormally large discrepancy between their Verbal IQ score and their Performance IQ, making their Full Scale IQ Score not interpretable ($p < .05$). There was also abnormal scatter within the subscales that comprise Verbal IQ for 16 students (59.o% of the sample; $p < .05$) and within the Performance IQ subscales for 11 students (40.7% of the sample; $p < .05$).[3]

[3] However, 3 of these 11 subjects with abnormal scatter in their Performance IQ subscale scores did not have significant discrepancies between their Perceptual Organization Index and their Processing Speed Index ($p > .05$) suggesting that for those 3 subjects the discrepancy found between the seven subscales was not polarized between the Index scores.

Additionally, some of the Indexes were derived from abnormally variable subscale scores that may have resulted in an Index score that was not cohesive. Five students (18.5% of the sample) had an abnormal scatter within their Verbal Comprehension Index subscale range ($p < .05$), 10 (38.5% of the sample) within their Working Memory Index subscale range ($p < .05$), 12 (50% of the sample) within their Perceptual Organization Index subscale range ($p < .05$), and 5 (19.2% of the sample) within their Processing Speed Index subscale range ($p < .05$).

Strengths and weaknesses for individual subscales mirror those found in the composite IQ scores and Index scores. Of the subscales that make up the Verbal Comprehension Index, very few students showed weaknesses (1 participant (3.4% of the sample) in the Information subscale ($p < .05$) and 1 (3.4% of the sample) in the Comprehension subscale ($p < .05$)). In contrast, many students (12 (72.4% of the sample) in the Vocabulary subscale, 14 (48.3% of the sample) in the Similarity subscale, 6 (20.7% of the sample) in the Information subscale, and 11 (37.9% of the sample) in the Comprehension subscale) showed strengths in the subscales that comprise the Verbal Comprehension Index ($p < .05$). Similarly, there were only 10 instances of students having weaknesses in the subscales that comprise the Perceptual Organization Index (5 participants (17.2% of the sample) in the Picture Completion subscale ($p < .05$), 3 (10.3% of the sample) in the Picture Arrangement subscale ($p < .05$), and 2 (6.9% of the sample) in the Object Assembly subscale ($p < .05$)) while there were 34 instances of students having strengths in these subscales (2 (6.9% of the sample) in the Picture Completion subscale ($p < .05$), 10 (34.5% of the sample) in the Block Design subscale ($p < .05$), 19 (65.5% of the

sample) in the Picture Arrangement subscale ($p < .05$), and 2 (6.9% of the sample) in the Object Assembly subscale ($p < .05$)).

Of the subscales that comprise the Working Memory Index, there were only 7 instances of students having strengths (5 (17.2% of the sample) in the Arithmetic subscale ($p < .05$) 2 (6.9% of the sample) in the Digit Span subscale ($p < .05$)) and 28 instances of students having weaknesses (9 (31.0% of the sample) in the Arithmetic subscale ($p < .05$), 18 (62.1% of the sample) of the Digit Span subscale ($p < .05$), and 10 (34.5% of the sample) of the Letter-Number Sequencing subscale ($p < .05$)). Similarly, there were only 2 instances of students having strengths in the subscales that comprise the Processing Speed Index (2 (6.9% of the sample) in the Digit-Symbol Coding subscale ($p < .05$)) and 21 instances of students having weaknesses (16 (55.2% of the sample) in the Digit Symbol subscale ($p < .05$) and 5 (17.2% of the sample) in the Symbol Search subscale ($p < .05$)).

Cognitive Performance and Academic Strategies

Correlations between the total number of strategies endorsed and each of the 19 cognitive test scores were examined. Total number of strategies used was found to be negatively correlated with Verbal Comprehension Index ($r = -.455$, $p < .05$) and Vocabulary subscale, ($r = -.510$, $p < .05$) performance. Students with lower scores on each of these cognitive tests reported using a larger number of strategies. No relationships were found between the four Indexes (See Table 7).

Additionally, multiple regressions were run to explore whether, after controlling for the total number of strategies used, there were cognitive differences between students' who endorsed various strategies and those who did not endorse

such strategies (See Table 8 for descriptive statistics supporting these associations). Those strategies whose use significantly differed according to level of deficit in the areas within which LD students typically have deficits (working memory and processing speed) are reported below. Findings related to significant differences in strategy endorsement for cognitive areas that are not distinctive in LD populations (verbal comprehension and perceptual organization) are explored only when they help to illuminate a hypothesized association.

Working memory. When examining the use of individual study strategies relative to performance in working memory, those students who reported organizing their notes by making visual representations, such as simple charts, sketches, tables, etc or by color coding, highlighting, or underlining their notes, as well as those who reported picking study strategies that help them rely on their stronger skills all had lower Working Memory Index scores than students who did not use these strategies. Students who reported making charts, sketches, or using other non verbal tools also had lower scores on the Perceptual Organization Index's Object Assembly subscale than those who did not and students who reported color coding, underlining, or highlighting their notes while studying had lower Verbal Comprehension Index scores than those who did not use these strategies. Additionally, students who reported planning their free time to increase efficiency and students who reported limiting their nonacademic commitments during the school semester had significantly lower Working Memory Index scores than those who did not use these strategies, as did students who indicated that they choose preferential seating in lectures.

Although the use of most strategies did not relate to the Working Memory Index score, some individual strategies did relate to the subscales that comprise the Index. When examining individual strategies according to performance in the Arithmetic subscale, those students who reported supplementing their class notes by comparing them to other students' notes, using folders or portable file binders to organize their notes, or preparing for their lectures by doing the reading before class all had significantly lower Arithmetic scores than those who did not utilize these strategies. Students who reported studying for a test by reading/rereading all or parts of assigned readings before a test, memorizing important facts by repeating them over and over (either orally or nonverbally), making lists or outlines of key concepts, or trying to relate the course material to their own experience all had significantly lower Digit Span subscale scores than those who did not utilize these strategies as did students who reported taking breaks while writing papers or writing papers one section at a time. Students who indicated that they make outlines or lists of key concepts while studying also had lower scores on the Perceptual Organization Index's Block Design subscale and Matrix Reasoning subscale than those who did not. Finally, students who reported being careful to double check the task before writing papers or in-class essays had significantly lower Letter-Number Sequencing subscale scores than those who did not utilize the strategy.

In contrast, when examining the use of individual reading strategies according to performance in working memory those students who reported making mental images of scenes while reading texts or reading and rereading texts until they understood the material had significantly higher Working Memory Index scores than

those who did not report utilizing these strategies. Students who reported studying for a test by trying to anticipate the essay questions or rereading previous outlines when studying for a cumulative exam also had significantly higher Working Memory Index scores than those who did not utilize these strategies. Finally, students who reported not taking any class notes had significantly higher Working Memory Index scores than students who took class notes.

Additionally, even when the Working Memory Index score was not related to the use of individual strategies, some of the subscales that comprise the Working Memory Index were. Those students who reported studying by reading over their notes and outlines had significantly higher Arithmetic subscale scores than those who did not utilize this strategy. Students who reported taking notes from transcriptions of lectures, printing out papers in order to mark up and proof read them, or talking to their professors about their learning disabilities all had significantly higher Digit Span subscale scores than those who did not utilize these strategies. Finally, students who reported taking the time to explain, either to themselves or to others, the reasoning behind their answer choices had significantly higher Letter-Number Sequencing subscale scores than those who did not.

When examining test taking strategies, students who reported tackling the more difficult sections first had significantly higher Working Memory Index scores while those who reported focusing on the easier sections of the test first had significantly lower Working Memory Index scores. Students who reported taking hierarchically outlined notes (e.g., using roman numerals) of the texts as they read had higher Digit Span subscale scores than those who did not, and yet students who

reported that they take notes while reading texts or stories had lower Arithmetic subscale scores than those who did not take notes. Students who indicated that they take notes while reading also had lower Verbal Comprehension Index scores than those who did not.

Processing speed. When examining the use of individual study strategies according to performance in processing speed, students who endorsed the study habits of gathering and organizing all their notes before starting to study, writing papers and essays one section at a time, or planning ahead to ensure they will be able to use their official accommodations (e.g., extended time), all had significantly lower Processing Speed Index scores than those who did not use these strategies, as did students who reported setting up the formulas and logic first when working on problem sets or reading slowly to ensure comprehension. Some strategies, though not related to students' Processing Speed Index scores, were related to their scores in the subscales that comprise the Processing Speed Index. Students who reported writing quickly while taking notes and leaving gaps to fill in later if they fell behind or managing their time by planning ahead for long range assignments in order to monitor their progress and ensure completion all had significantly lower Digit-Symbol Coding subscale scores than those who did not use these strategies. Students who reported doing the work for problem sets multiple times to check math, making an easier version of the problem in the same style as the one assigned, or using a calculator had significantly lower Symbol Search subscale scores than those who did not use these strategies.

In contrast, students who reported not taking notes in class but just listening and those who reported transcribing lectures nearly word for word when taking notes had significantly higher Processing Speed Index scores than those who did not use these strategies. Students who reported taking notes by transcribing lectures nearly word for word also had lower Verbal Comprehension Index scores than students who did not. Students who reported studying for a test by using flash cards to memorize important material or asking a professor or TA what material they think is most important or how they think the student should study also had significantly higher Processing Speed Index scores than students who did not use these strategies. Finally, students who reported proofreading their papers by writing and rewriting such papers until they are error free, highlighting or underlining the important parts of readings, or having separate to do lists for long term and short term assignments all had significantly higher Processing Speed Index scores than student who did not use these strategies did. Students who indicated that they highlight or underline the important parts of readings also had higher Perceptual Organization Index scores than students who did not.

Additionally, those students who reported managing their time by developing a time line for major assignments and tests or finding strategies to make difficult tasks easier had significantly higher Digit Symbol subscale scores than those who did not use this strategy. Students who reported preparing for a test by going to study groups, redoing all previous outlines/making new outlines when studying for cumulative exams, and those who reported going with their instinct when answering multiple choice questions, as well as those who reported using the time management strategy

of having separate categories of to do lists all had significantly higher Symbol Search subscale scores than those who did not use these strategies.

Only a few strategies that related to verbal comprehension or perceptual organization, but not to working memory or processing speed, were found to be relevant. Specifically, students who reported circling answers on tests to facilitate checking the Scantron for careless errors had significantly higher Verbal Comprehension Index scores. Students who reported underlining or circling the description of the task in test instructions and those who reported crossing out the wrong answers on multiple choice questions had higher scores on the Perceptual Organization Index's Picture Completion subscale and Object Assembly subscale, respectively. Students who follow test directions precisely had higher scores on the Perceptual Organization Index's Block Design subscale and those who reported working slowly on problem sets to monitor for errors in operations or careless mistakes had higher scores on the Verbal Comprehension Index's Vocabulary subscale, Information subscale, and Comprehension subscale and on the Perceptual Organization Index.

Discussion

Strategy Use of LD and NLD Students

A major goal of this study was to explore the strategies that LD students use to cope with the curriculum challenges within a highly selective college setting, and to see if the strategies used by LD students differ from the ones that NLD students use. As past research has found (e.g., Nist, Simpson, & Olejnik, 1991), the coping

methods of LD students were very personalized to each students needs, with the number of endorsements ranging from 37 to 154 of the 205 strategies examined.

Similar to past research, the average number of strategies used by LD and NLD students was statistically similar (Heiman & Precel, 2003; Ruban, et al., 2003; Trainin & Swanson, 2005). However, unlike past research (e.g., Heiman & Precel, 2003), where LD students' GPAs were found to be related to the total number of strategies used, in the present study neither LD nor NLD students' GPAs were related to the total number of strategies used. This difference may be a result of differences between the populations from which the data was collected. For example, Heiman & Precel's (2003) sample was drawn from a population attending the Open University in Israel, a university that has flexible standards to allow for part time study and is open to anyone who wishes to attend. In contrast, this study's sample was collected from a highly selective small, liberal arts university. Out of the 7,750 applications received, only 2,123 (27%) were accepted in the 2007 school year. In the most recent entering class, 80% of the students admitted were in the top decile of their high school class with average SAT scores in verbal, math, and writing ranging between the 93rd and 96th percentile (Pyke, 2007). It may be that at this highly selective school, NLD and LD are exposed to a curriculum that forces everyone, LD and NLD student alike, to rely heavily on academic strategies in order to succeed.

When comparing the strategies that LD students endorse to those that NLD students report using, there are many fewer differences than had been anticipated. There were a few individual strategies that differentiated the LD and NLD samples, including working slowly to monitor for careless mistakes while doing problem sets,

following test directions precisely, using symbols or abbreviations to speed up note-taking, supplementing notes by comparing them to others' class notes, trying to anticipate test format while studying, color coding, outlining, or highlighting notes while studying, and making outlines of key concepts. However, there were not any convincing patterns to suggest that the differences found could augment the findings of earlier studies. Overwhelmingly, endorsement of the vast majority of strategies was found to be similar for LD and NLD students.

Nonetheless, there were some global patterns that differentiated LD students' habits from NLD students' habits. Specifically, LD students were more likely to report making strategic changes to their work load. For example, LD students were more likely to pick their course load so that they were taking fewer hard courses and so that their courses had a balanced work load (e.g., balancing classes that had a great deal of reading with classes that were mostly problem set based) and, although not reported in the results, there was a trend toward LD students picking fewer courses in areas they found difficult. These findings seem to suggest that LD students may cope with academic demands by controlling the type and amount of work they are encountering, rather than using any individual strategies. It is possible that this finding is another example of how LD students are more likely to control their overall learning process and be more aware of their work process and progress than NLD students, as Heiman (2006) recently found.

The theory that LD students are making global changes to their academic experience is also supported by an overall trend found for a difference between the LD and NLD students' likelihood of majoring reading/writing intensive majors, a

major that would depend on skills that are known to be difficult for LD students (Vogel & Adelman, 1992; Wilsczenski, 1993). When looking at post hoc tests, significantly fewer LD students than NLD students majored in departments that are reading and writing intensive. Further, although the overall effect of major by department was not significant, there were significantly more NLD student in the Humanities major than LD students, a major that Heilman and Precel (2003) found LD students more frequently reported having difficulties in than NLD students did. This trend suggests that in addition to picking their courses based on the type of work load, LD students may also pick their majors by similar criteria

Confirming previous research, LD students in this study did not utilize a large number of official accommodations (e.g. Mellard & Byrnes, 1993; National Center of Education Statistics, 2003). Further, as has been previously found (e.g., Alster, 1997; Ofiesh, Mather & Russell, 2005), the use of extended time was disproportionately higher than the use of any other official accommodation. Using a word processor and taking tests in separate locations were each used by approximately a quarter of LD students. The remaining 10 official accommodations[4] were each endorsed by fewer than 15% of LD students, suggesting that most official accommodations traditionally offered by universities are not commonly relied on by LD students.

Cognitive Profiles of LD Students

The mean Full Scale IQ for this study's LD students was 124 with more than 70% performing a standard deviation or more above the standardized mean

[4] These accommodations include additional rest breaks during tests, leniency with assignment deadlines, early receipt of assignments, advanced notice for all quizzes and exams, use of a calculator for exams and in-class work where calculation is non-essential, leniency on spelling and grammar where spelling and grammar is non-essential, test reader, test recorder/writer, use color film to put over text for reading, and alternative test format.

(i.e., above 115). Since all other Index scores fell within the range of typical high functioning adults with learning disabilities (as measured by Gregg, Coleman, Lindstrom, & Lee, 2007), it appears that these LD students' unique strength lies in their unusually high Verbal Comprehension Index, which, at 134, is even higher than that of college students without learning disabilities, as recorded by Gregg, Coleman, Lindstrom and Lee (2007). This Index has been shown to be a strong measure of crystallized intelligence (Haavisto & Lehto, 2004), which reflects scholarly achievement and cultural knowledge (Cattell, 1971). It is likely that this strength may help LD students achieve success with highly rigorous curricula. Notably, LD and NLD students at this selective university appear to be doing equally well when success is measured by current GPA.

Even with superior Verbal Comprehension Index and high average Perceptual Organization Index scores, LD students at this highly selective university displayed relative deficits in working memory and processing speed that are classic of LD students. Particularly classic were the discrepancies found between participants' strongest and weakest cognitive abilities. Nearly all of the participants had at least a 1 SD difference between their highest and lowest Index scores and almost half had at least a 3 SD difference. One participant actually had a 4 SD difference between the Verbal Comprehension Index and Processing Speed Index scores. Even with these extreme discrepancies, very few students had any scores that were more than a standard deviation below the norm, even in their weaker cognitive domains.

Despite the overall trends found, there still was substantial heterogeneity within the LD sample. The range within all scales was at least 40 points, with some

scales ranging as much as 55 points, or more than 3 SD. The Perceptual Organization Index had the largest range, with participants scoring from 1 SD below the norm to more than 2 SD above the norm. Even the scales with the least amount of variability, the Verbal IQ and the Verbal Comprehension Index, showed participants scoring from within 1 SD of the norm to more than 3 SD above the norm. Although for the most part participants either all had strengths or all had weaknesses in specific subscales, there were many instances where a few students had strengths in areas where most LD students had weakness or weaknesses in areas where most LD students had strengths. It is clear that even in a small sample, the heterogeneity that is classic of LD populations can be seen.

Cognitive Deficits and Academic Strategies

Given that there is such heterogeneity in this sample, it is useful to explore how differing cognitive deficits influenced the strategies that LD students use to cope with their academic tasks. Many studies have looked at how GPA interacts with types of strategies used, but very few, if any, studies have explored which strategies are utilized by people with different types of cognitive deficits. Interestingly, the only relationship found between the total number of strategies used and students' cognitive deficits was with the Verbal Comprehension Index and the Vocabulary subscale. The more strategies students used, the lower their verbal ability, reaffirming the importance of verbal abilities. When exploring the individual strategies based on their relationship to the students cognitive deficits, a number of patterns became apparent. These patterns are discussed below.

Selecting strategies. The selection of overall coping strategies was one area in which there was an association between the use of strategies and students' cognitive deficits. Students who reported relying on their stronger skills to get them through their academic tasks had lower Working Memory scores than those who did not use this strategy. However, students who reported utilizing strategies to make difficult tasks easier had higher Processing Speed scores than students who did not. The subtle difference between these two strategies explains the discrepancy. The use of the first strategy, which was associated with lower Working Memory scores, refers only to relying on strengths, while the use of the second strategy, which was associated with having higher Processing Speed scores, is particular to finding strategies to make difficult tasks easier. As in most liberal arts schools, students in this study are able to create their own academic experience. As such, students who felt more secure in their ability to handle a rigorous course load might be more likely to take difficult classes than those who did not. It seems possible those students with faster processing speeds, which is known to bolster working memory's capacity and make learning new material easier, might choose to take a course load that would expose them to a higher number and level of difficult tasks with which they would have to learn how to cope, while those students who had weaker working memories mighty simply rely on their stronger skills to compensate for their deficits.

Time saving strategies. Students who utilize more time management strategies such as planning out their work timeline for long term assignments to monitor their progress and ensure enough time to complete projects, planning out their free time to increase efficiency, and limiting nonacademic commitments during the school year

had larger deficits in LD students' typically weaker cognitive domains than students who do not utilize these strategies. This may be a response to LD students' slower work pace. Heiman and Precel (2003) found that whereas NLD student tended to report being able to increase their speed of work when, for example, they get closer to a deadline, many LD students reported not having any way to increase their work speed, suggesting that they had been working at their maximum speed all along. Similarly, Trainin and Swanson (2005) found that LD students were more likely than NLD students to take steps, such as preparing for exams early, in order to avoid having to study under pressure. Perhaps LD students with larger deficits in working memory and processing speed struggle more to keep up with their work load than LD students with smaller deficits in these areas do. Their reliance on time management strategies may be a way to compensate for their slower work pace. They may be ensuring that they have enough time to complete their work by limiting the number of other additional obligations they have, starting their assignments earlier and being highly conscious of how much time it takes to complete an assignment, or working very efficiently during the time they do have free.

Additionally, it seems that students who take steps to save time and streamline their study processes by trying to anticipate the essay questions while studying or asking what and how they should study tended to have smaller deficits in the traditionally weaker domains of LD students. If, as has already been posed, these students (who are by definition better able to manipulate and learn new information) are selecting a different type of academic challenge than students with larger deficits, then this finding may be a result of their need to study as efficiently as possible due to

the increased difficulty of their academic challenges. This theory is further supported by the finding that students who report talking to their professors about their LD had higher Working Memory scores than those who do not. If the students who have smaller deficits are choosing to take more difficult courses, they would be expected to have to depend on additional support or leniency from their professors and thus would be more likely to discuss their learning disabilities with their professors than students who have larger deficits, which might prevent them from even being in as demanding a situation.

Note-taking strategies. Students who reported enhancing their class notes after classes, either by supplementing their notes by comparing them to other students' class notes or by writing quickly and leaving gaps to fill in later, had lower Working Memory scores and Processing Speed scores (respectively) than those who did not. In contrast, students who reported not having to take notes at all, instead simply relying on listening to lectures had higher Working Memory and Processing Speed scores than those who did not. Listening to a lecture, processing the information in a meaningful and deep manner, and taking notes, are very complex tasks that isolate many of the areas in which LD students struggle. It is not surprising that students with greater deficits seem to strain to keep up and rely on outside sources in order to obtain notes, let alone that they are more likely to take class notes instead of simply listening to the lecture. This dichotomy was also seen in the LD sample as a whole, which was more likely than the NLD sample to supplement their notes by comparing them to the notes of other students. Interestingly, NLD students were more likely to speed up their note-taking by using symbols or abbreviations,

perhaps because LD students are not capable of taking notes any faster than they already are, just as Heiman and Precel (2003) found that many LD students report not being capable of studying any faster than they already are.

Curiously, students who transcribe lectures, taking notes word for word instead of trying to process and outline the material as it is presented, had higher Processing Speed scores. This is surprising as faster processing speed is known to help facilitate longer storage of information and more complex manipulations of information (Fry & Hale, 1996), two tasks that are heavily involved in listening to a lecture, retaining what was just said, and manipulating the information to better understand its relevance and determine how best to record the information in note form. Thus, one might expect that student with higher processing speeds would be able to utilize more effective note-taking techniques than simply transcribing a lecture.

However, the use of transcribing lectures word for word is also related to having lower Verbal Comprehension scores. Since the verbal comprehension tests involve listening to audible material, processing the information, and determining correct responses, someone who scores more poorly on verbal comprehension may have greater difficulty with audible learning, which would make listening to lectures and processing the information more difficult. It would not be surprising if a student with greater deficits in this domain, regardless of their strengths in processing speed, chose to transcribe the information word for word in order to eliminate the need to process material as it is presented.

This interpretation is brought into question, however, by the finding that the 4 participants who indicated that they took notes from transcribed lectures or revisited recordings of lectures had significantly higher Working Memory scores than the 21 LD students who did not. This suggests that it may actually be the case that students with smaller deficits are relying on transcribed notes and thus taking steps to eliminate the need to process material as it is presented, and not that the use of this strategy is a result of lower verbal comprehension. However, because there are so few participants with IQ scores who indicated that they take notes from transcribed lectures or revisit recordings of lectures, further study would need to be done before any conclusions should be made.

Monitoring for careless mistakes. It seems that students who report taking steps to avoid careless mistakes, such as setting up logic and formulas first, reading slowly to ensure comprehension, doing work multiple times for problem sets in order to check their math, making an easier version of the problem in the same style as the one assigned, and double checking the task before writing a paper had lower scores in LD students' typically weaker cognitive domains than those who did not. Many of these strategies, for example doing the work in problem sets multiple times to check for mistakes in the math, are clearly examples of LD students taking steps to monitor for careless mistakes. However, the LD students' motivations for using some of these strategies are not as clear. For example, LD students who set up the logic and formulas before answering problems may be relying on stepwise processing, one of the few strategies that Heiman (2006) found that LD students use more often than NLD students, as opposed to trying ensure that the question is understood and that

mistakes are not made while doing the work. Nonetheless, it seems that students who are taking steps to avoid careless mistakes have greater deficits in LD students' weaker domains.

Interestingly, some strategies, such as taking the time to underline task instructions, crossing out all answers that are incorrect in multiple choice questions, circling answers on tests to facilitate checking the Scantron for errors, or working slowly to monitor for errors and careless mistakes when doing problem sets are used more by students who are stronger in verbal comprehension or perceptual organization, two domains with which LD students normally exhibit strengths. This may be another indication that students who have stronger cognitive skills to rely on are able to push themselves into environments in which they have to accommodate at a higher level in order to succeed.

Use of verbal and non verbal strategies. The dichotomy found by Heiman and Precel (2003) between LD students' use of nonverbal strategies such as highlighting notes, and NLD students use of verbal strategies such as summarizing main ideas, seems to be similar to the difference found between the use of verbal and nonverbal strategies by LD students with higher and lower deficits in processing speed and working memory.

Students who used nonverbal study strategies such as making charts, sketches, diagrams, tables, etc. of notes, as well as color coding, underlining or highlighting notes while studying had lower average Working Memory scores than those who did not. Additionally, though students who reported taking notes while reading, a strategy that initially appears to be verbal, had lower Working Memory

scores, students who reported using the specific note-taking strategy of making hierarchical outlines while reading had higher Working Memory scores than those who did not. It is unclear what the students who reported taking notes while reading are doing, if they are specifically not making hierarchical outlines. It is possible that they are making flow charts, tables, or other more visual methods of taking notes. This could mean that these students who take notes while reading may actually be utilizing nonverbal strategies not verbal ones, thus supporting the theory that students with greater deficits in working memory rely on nonverbal strategies more than those with smaller deficits do. It is unclear in what way these students were using the notes that they took while reading.

Additionally, lists and outlines, although often thought of as verbal strategies, may actually be more visually oriented, as it is possible to use them to visually represent the relationships between different concepts. The possible classification of lists and outlines as nonverbal strategies is supported by the finding that not only did students who reported making lists or outlines of key concepts while studying have lower Working Memory subscale scores in Digit Span than those who did not, but LD students also reported using this strategy more frequently than NLD students. If Heiman and Precel's (2003) finding that LD students use nonverbal strategies more frequently than NLD students is to be used as an indicator, it would suggest that making lists and outlines of key concepts is actually more of a nonverbal strategy than a verbal one.

In contrast, students who reported highlighting or underlining important parts of readings, a distinctly nonverbal method, had faster processing speed than those

who did not. It is well known that shallow processing, such as highlighting and underlining, is a less effective study tool than deeper processing, such as drawing charts or making diagrams (Craik & Lockhart, 1972). Perhaps simply highlighting and underlining is not a thorough enough strategy for students with larger deficits, but students with smaller deficits are able to utilize this technique effectively. Alternatively, this finding may simply be a result of the exploratory nature of this study, and may not be indicative of any overall pattern.

Though pattern of LD students with larger deficits using nonverbal strategies more does seem to bear some similarity to the discrepancy between LD and NLD students' use of nonverbal strategies, no difference was found in the use of verbal strategies by LD students with larger and smaller deficits. This finding serves to remind us that the relationship between LD and NLD students is not comparable to the relationship between LD students with larger and smaller deficits. No matter how high their Working Memory and Processing Speed scores, LD students still struggle to compensate for working memory and/or processing speed abilities that are significantly below their overall ability. Nonetheless, there is some indication that the strategies that LD students generally report using are relied on more heavily by students with larger deficits in working memory and processing speed than those with smaller deficits.

Conclusions and Limitations

The findings demonstrate that LD students at this highly selective university seem to be very intelligent with particularly high verbal capabilities, who cope with their cognitive deficits by making global accommodations. These students carefully

select their courses and majors as well as use time management strategies to ensure that, despite a slower work pace and other cognitive deficits, they can handle the academic challenges that they face. It seems that it is the use of these global academic decisions that allow the LD students to succeed at a level equal to their NLD peers, rather than any of the more specific individual accommodations, the use of which vary greatly from person to person.

When comparing LD students with varying cognitive deficits, it seems that those who are more likely to use the strategies on which LD students typically rely have larger deficits in working memory and processing speed, the two cognitive areas that are at the heart of LD students' deficits. The few deviations from this trend may indicate that in some cases LD students with smaller deficits are choosing greater academic challenges that necessitate them to further rely on coping strategies.

These findings need to be viewed in light of the effect that a limited sample size has on a study of this nature. In order to deeply explore the relationship between strategy use and specific cognitive deficits it is necessary to look at the sample in groups, as opposed to on a continuous spectrum. However, without a larger sample size it is not possible to break the sample down further, as this process would necessitate. Similarly, though an attempt was made to explore the varying cognitive strengths and weaknesses, the sample size prohibited any exploration of the cognitive scores at an individual level, as opposed to within the sample as a whole. The small sample size also made it impossible to explore other interesting questions, such as the role that the students' majors and the affect that students' specific type of learning

disability (e.g., verbal LD, nonverbal LD, or ADHD with a learning disability) had on the strategies that students used.

Though future work is still needed, the findings of this study have greatly increased our understanding of the tools that LD students use to cope with highly challenging environments. This study was able to obtain a greater level of specificity by using a questionnaire that guided participants through their standard academic tasks and provided an exhaustive list of strategies for students to choose from, rather than relying on broad, open-ended questions or questionnaires that utilize a few target strategies to learn about students' general use of strategies. This study offers insight into how LD students cope with the difficult transition to the independent work environment of postsecondary education and is a first step toward differentiating the strategies that are most useful for students with varying cognitive deficits.

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Table 1. Available Documentation for the LD Sample

	WAIS-III (n)	WISC-III (n)	**Total (n)**
Verbal IQ	22	7	**29**
VCI	21	5	**26**
(Subscale) Vocabulary	22	5	**27**
Similarities	22	5	**27**
Information	22	5	**27**
Comprehension [1]	22	5	**27**
WMI/FDI[2]	21	5	**26**
Arithmetic	22	5	**27**
Digit Span [3]	22	4	**26**
Letter-Number Sequencing [4]	21	*N/A*	**21**
Performance IQ	22	7	**29**
POI	21	5	**26**
Picture Completion	22	5	**27**
Block Design	22	5	**27**
Matrix Reasoning [5]	22	*N/A*	**22**
Picture Arrangement [6]	21	5	**26**
Object Assembly[7]	7	6	**13**
PSI	21	4	**25**
Digit Symbol-Coding/Coding	21	5	**26**
Symbol Search	21	3	**24**
Full Scale IQ	22	7	**29**

Note. VCI = Verbal Comprehension Index; WMI = Working Memory Index; FDI = Freedom From Distractibility Index; POI = Perceptual Organization Index; PSI = Processing Speed Index.

[1] Not used in WISC-III to compute Verbal Comprehension Index.

[2] Working Memory Index in WAIS-III and Freedom From Distractibility Index in WISC-III.

[3] Not used to compute IQ in WISC-III.

[4] Not used in WISC-III at all.

[5] Not used in WISC-III at all.

[6] Not used in WAIS-III to compute Perceptual Organization Index.

[7] Used as a substitute for a Performance subtest in WAIS-III, Used to calculate Perpetual Organization Index in WISC-III.

Table 2. Characteristics of LD and NLD Students

	LD	NLD	
	Mean (SD)	Mean (SD)	P
GPA	3.48 (.36)	3.55 (.45)	.559
Extracurricular Hrs	12.16 (7.94)	10 (5.79)	.240
	n (%)	n (%)	
Major by Department			
Overall Effect			.102
Post Hoc tests			
Humanities	5 (16.7%)	**12 (42.0%)**	.030**
Social Sciences	14 (46.7%)	7 (25.0%)	.107
Natural Sciences & Math	10 (33.3%)	9 (32.1%)	.986
Arts	1 (3.3%)	0	N/A
Major by Type of Class Work			
Overall Difference			.056*
Post Hoc Tests			
Reading/Writing Intensive	14 (41.2%)	**20 (58.8%)**	.048**
Not Reading/Writing Intensive	**16 (66.7%)**	8 (33.3%)	.074*

* Values are approaching statistical significance.
** Values are statistically significant at a .05 level.

Table 3. Official Accommodation Used by LD Students

Official Accommodations	n (%)	Official Accommodations	n (%)
Extended time on exams	26 (81.2%)	Additional rest breaks during tests	1 (3.1%)
Use of word processor	8 (25.0%)	Use color film to put over text for reading	1 (3.1%)
Separate testing location	7 (21.9%)	Early receipt of assignments	0
Use of a calculator for exams and in-class work where calculation is non-essential	4 (12.5%)	Test reader (i.e., you have tests read to you)	0
Leniency on spelling and grammar where spelling and grammar is non-essential	4 (12.5%)	Test recorder/writer (i.e., someone records your responses for you)	0
Leniency with assignment deadlines	3 (9.4%)	Alternative test format	0
Advanced notice for all quizzes and exams (i.e., no pop quizzes)	2 (6.2%)		

Table 4. Strategies That Differentiate LD and NLD Students

	LD	NLD	
	n (%)	n (%)	P
Take/Organize Class Notes			
Supplement notes with classmate's notes	**16 (57.1%)**	9 (31.0%)	.047*
Use symbols or abbreviations to speed up note-taking	13 (46.4%)	**22 (75.9%)**	.022*
Use folder or portable file-binders to organize notes	**13 (46.4%)**	4 (13.8%)	.007**
Problem Set/Reading			
Read all the textbook features	**16 (57.1%)**	6 (20.7%)	.005**
Identify key points while reading to main review easier	**17 (60.7%)**	9 (31.0%)	.025*
Change reading strategy if difficulties arise	**10 (37.0%)**	3 (10.3%)	.018*
Work slowly and monitor for errors	**18 (64.3%)**	8 (27.6%)	.005**
Study Methods			
Study by reading over notes and outlines	**27 (96.4%)**	22 (75.9%)	.025*
Try to anticipate test format	**22 (78.6%)**	15 (51.7%)	.034*
Make outline of key concepts	**13 (46.6%)**	6 (20.7%)	.039*
Copy notes over/reorganize notes	**13 (46.4%)**	6 (20.7%)	.039*
Study hard material first	2 (7.1%)	**8 (27.6%)**	.042*
Study in long sittings	**18 (64.3%)**	10 (34.5%)	.024*
Test Taking Strategies			
Use all available time	**23 (82.1%)**	16 (55.2%)	.045*
Follow test directions precisely	16 (57.1%)	**25 (86.2%)**	.015*
Writing Papers			
Read over to check spelling and grammar	17 (63.0%)	**25 (86.2%)**	.045*
Course Load Management			
Balance course load by type of work	**21 (77.8%)**	13 (44.8%)	.012*
Take fewer difficult courses	**11 (40.7%)**	4 (13.8%)	.023*

Note. Four participants were dropped from all analyses regarding differences between LD and NLD students' strategy use due to incomplete questionnaires. One participant was dropped from all analyses regarding total strategy use and select additional strategies due to an incomplete questionnaire.
* Values are statistically significant at a .05 level.
** Values are statistically significant at a .01 level.

Table 5. Total Strategies Used by LD and NLD Students

	LD	NLD	
	Total Strategies	Total Strategies	P
Mean (SD)	104.4 (6.03)	98.6 (5.82)	.493
Minimum	37	49	-----
Maximum	154	152	-----
25th Percentile	83	72	-----
50th Percentile	112	98	-----
75th Percentile	130	125	-----

Table 6. LD Students' Cognitive Testing

	Mean	Mean Percentile	SD	Min-Max	Weakness*	Strength*	Abnormal Discrepancy w/in group*	1SD above norm	1 SD below norm	Total (n)
					n (%)	n (%)	n (%)	(n)	(n)	
VCI	133.88		10.97	110-150			5 (18.5%)	24	0	26
(Subscale) Vocabulary		95.14	2.25	12-19	0	21 (72.4%)		25	0	27
Similarities		91.86	1.98	10-19	0	14 (48.3%)		26	0	27
Information		91.89	1.85	12-19	1 (3.4%)	6 (20.7%)		25	0	27
Comprehension[1]		89.97	2.70	11-19	1 (3.4%)	11 (37.9%)		20	0	27
WMI/FDI[2]	109.65		11.39	93-138			10 (38.5%)	10	0	26
Arithmetic		78.30	3.10	7-18	9 (31.0%)	5 (17.2%)		16	2	27
Digit Span[3]		58.58	2.12	7-15	18 (62.1%)	2 (6.9%)		6	2	26
Letter-Number Sequencing[4]		62.03	2.97	8-18	10 (34.5)	0		6	0	21

Note. VCI = Verbal Comprehension Index; WMI = Working Memory Index; FDI = Freedom From Distractibility Index; POI = Perceptual Organization Index; PSI = Processing Speed Index.

[1] Not used in WISC-III to compute Verbal Comprehension Index.

[2] Index called Working Memory Index in WAIS-III and Freedom from Distractibility Index in WISC-III.

[3] Not used to compute IQ in WISC-III.

[4] Not used in WISC-III at all.

* Values are statistically significant at a .05 level.

Table 6 (cont.). LD Students' Cognitive Testing

	Mean	Mean Percentile	SD	Min-Max	Weakness*	Strength*	Abnormal Discrepancy w/in group*	1SD above norm	1 SD below norm	Total (n)
					n (%)	n (%)	n (%)	(n)	(n)	
Performance IQ	113.90		11.58	83-134			11 (40.7%)	12	1	29
POI	118.12		12.41	84-138			12 (50%)	17	1	26
Picture Completion		66.11	2.68	4-17	5 (17.2%)	2 (6.9)		8	1	27
Block Design		74.32	3.36	7-19	0	10 (34.5%)		14	1	27
Matrix Reasoning[5]		92.77	1.54	11-17	0	19 (65.5%)		21	0	22
Picture Arrangement[6]		69.92	2.84	7-19	3 (10.3%)	3 (10.3%)		13	1	26
Object Assembly[7]		48.85	1.50	8-13	2 (6.9%)	0		1	0	13
PSI	97.96		13.26	79-128			5 (19.2%)	3	5	25
Digit Symbol-Coding/Coding		39.62	2.53	5-15	16 (55.2%)	0		2	8	26
Symbol Search		52.33	3.15	6-19	5 (17.2%)	2 (6.9%)		4	3	24
Full Scale IQ	123.97		11.39	100-144			18 (62.1%)	21	0	29

[5] Not used in WISC-III at all.
[6] Not used in WAIS-III to compute Perceptual Organization Index. Not used to calculate abnormal discrepancies.
[7] Used as a substitute for a Performance subtest in WAIS-III, Used to calculate Perpetual Organization Index in WISC-III.
* Values are statistically significant at a .05 level.

Table 7. Index and IQ Score Correlations

	VCI	WMI	POI	PSI	Total Strategies
Verbal IQ					-.281
VCI	----	.311	.208	-.332	**-.455***
(Subscale) Vocabulary					**-.510***
Similarities					-.154
Information					-.218
Comprehension [1]					.016
WMI/FDI[2]		----	.302	.019	-.185
Arithmetic					-.064
Digit Span [3]					.204
Letter-Number Sequencing [4]					-.318
Performance IQ					.114
POI			----	.385	.255
Picture Completion					.382
Block Design					.242
Matrix Reasoning [5]					.073
Picture Arrangement [6]					-.317
Object Assembly[7]					-.455
PSI				----	.371
Digit Symbol-Coding/Coding					.272
Symbol Search					.172
Full Scale IQ					-.032

Note. VCI = Verbal Comprehension Index; WMI = Working Memory Index; FDI = Freedom From Distractibility Index; POI = Perceptual Organization Index; PSI = Processing Speed Index.

[1] Not used in WISC-III to compute Verbal Comprehension Index.

[2] Working Memory Index in WAIS-III and Freedom From Distractibility Index in WISC-III.

[3] Not used to compute IQ in WISC-III.

[4] Not used in WISC-III at all.

[5] Not used in WISC-III at all.

[6] Not used in WAIS-III to compute Perceptual Organization Index.

[7] Used as a substitute for a Performance subtest in WAIS-III, Used to calculate Perpetual Organization Index in WISC-III.

* Correlation is significant at the .05 level.

Table 8. Analysis of Variance for Strategy Use and Cognitive Test Scores

Strategy	Cognitive Test	IQ if Used			IQ if Not Used			df	F	P
		Mean	SD	n	Mean	SD	n			
Take/Organize Class Notes										
Do not take notes in class										
	WM-Index	**120.75**	6.45	4	107.64	10.99	22	25	2.81	.049
Listen to lectures without getting notes										
	PS-Index	**104.50**	15.44	8	94.88	11.32	17	24	3.30	.044
Supplement/compare notes with classmate's notes										
	WM-Arithmetic	12.15	3.18	13	**14.43**	2.68	14	26	2.94	.023
Transcribe lectures word for word										
	PS-Index	**107.14**	16.25	7	94.39	10.34	18	24	3.55	.035
	VC-Index	127.13	13.31	8	**136.89**	8.55	18	25	2.81	.044
Take notes form transcribed or record lectures after class										
	WM-Dig. Span	**13.75**	1.26	4	10.27	1.78	2	25	8.08	.001
Write quickly and leave gaps when falling behind										
	PS- Dig-Symb.	8.24	2.22	17	**10.22**	2.68	9	25	2.32	.049

Use folders or portable file-binders to organize notes										
	WM-Arithmetic	12.00	3.82	11	**14.25**	2.18	16	26	2.97	.023
Prepare for Lectures										
Do the readings before class										
	WM-Arithmetic	12.73	3.06	22	**16.00**	1.58	5	26	2.54	.034
Choose preferential seating in class										
	WM-Index	104.62	9.16	13	**114.69**	11.46	13	25	3.09	.037
Problem Sets										
Set up the formulas and logic first										
	PS-Index	92.50	9.87	10	**101.60**	14.26	15	24	7.48	.002
Use a calculator										
	PS-Symb. Search	9.00	1.73	11	**11.92**	3.50	13	23	12.35	.000
Work slowly and monitor for errors										
	PO-Index	**124.07**	8.43	14	111.17	12.96	12	25	4.55	.016
	VC-Vocabulary	**16.47**	2.23	15	16.00	2.34	12	26	5.52	.022
	VC-Information	**15.27**	1.91	15	14.33	1.72	12	26	4.01	.015
	VC-Comp.	**15.93**	1.60	15	14.17	2.59	12	26	2.21	.047
Do work multiple times to check math										
	PS-Symb. Search	9.00	1.73	5	**11.00**	3.33	19	23	2.93	.045
Make an easier version of the problem in the same style as the one assigned										
	PS-Symb. Search	8.33	2.08	3	**10.90**	3.18	21	23	3.07	.040

Reading										
Read and reread until text is understood										
	WM-Index	**111.07**	12.37	15	107.73	10.14	11	25	3.02	.040
Read slowly to ensure comprehension										
	PS-Index	96.75	12.64	16	**100.11**	14.84	9	24	3.53	.036
Highlight or underline the important parts of the reading										
	PS-Index	**103.13**	12.24	16	88.78	9.93	9	24	4.47	.023
	PS-Symb. Search	**11.73**	3.26	15	8.67	1.80	9	23	3.38	.030
Take notes while reading										
	WM-Arithmetic	12.36	2.50	14	**14.38**	2.29	13	26	2.19	.047
	VC-Index	128.69	9.66	13	**139.08**	9.96	13	25	3.54	.023
Make hierarchical outline of texts										
	WM-Digit Span	**12.75**	2.22	4	10.45	1.95	22	25	2.31	.049
Create mental image to describe scenes										
	WM-Index	**113.38**	11.48	13	105.92.	10.40	13	25	4.70	.010
Study Methods										
Color code, outline or highlight notes										
	WM-Index	101.57	7.63	7	**112.63**	11.22	19	25	2.84	.047
	VC-Index	124.43	10.26	7	**137.37**	9.20	19	25	5.22	.006

Make simple charts, sketches, tables, etc. to organize course materials										
	WM-Index	102.78	8.15	9	**113.29**	11.35	17	25	3.13	.036
	PO- Obj. Assem.	8.50	.71	2	**10.18**	1.47	11	12	6.16	.010
Reread all or parts of assigned readings										
	WM-Digit Span	9.93	2.20	14	**11.83**	1.53	12	25	4.28	.009
Read over notes and outlines										
	WM-Arithmetic	**13.74**	3.00	23	11.00	2.94	4	26	2.31	.042
Rehearse material through repetition of important facts										
	WM-Digit Span	10.42	2.27	19	**11.86**	1.21	7	25	2.29	.049
Use flash cards to memorize important material										
	PS-Index	**105.25**	13.60	12	91.23	8.95	13	24	4.79	.013
Make list or outlines of key concepts										
	WM-Digit Span	10.50	2.38	18	**11.50**	1.20	8	25	3.03	.026
	PO-Block Desigr	13.00	3.42	19	**13.25**	3.45	8	26	3.81	.049
	PO-Matrix Reasoning	14.60	1.64	15	**15.57**	1.13	7	21	4.08	.011
Try to relate material to personal experiences										
	WM-Digit Span	9.91	2.21	11	**11.47**	1.85	15	25	2.79	.033
Ask TA or Prof what/how to study										
	PS-Index	**108.78**	12.15	9	91.88	9.64	16	24	7.40	.002

Go to study groups										
	PS-Symb. Search	**12.30**	3.92	10	9.36	1.74	14	23	3.40	.030
Try to anticipate essay questions										
	WM-Index	**111.83**	11.32	18	104.75	10.59	8	24	3.03	.040
Read all previous outlines when studying for cumulative exams										
	WM-Index	**111.24**	11.58	17	106.67	11..02	9	25	2.77	.049
Redo/make new outlines when studying for cumulative exams										
	PS-Symb. Search	**14.00**	4.69	4	9.90	2.36	20	23	3.54	.027
Gather and organize all material before starting to study										
	PS-Index	95.67	13.10	15	**101.40**	13.42	10	24	4.61	.015
Pick study strategies that help focus reliance on stronger skills										
	WM-Index	100.57	6.90	7	**113.00**	10.97	19	25	3.77	.021
Test Taking Strategies										
Underline/circle tasks or descriptions of task in instructions										
	PO-Picture Completion	**13.20**	1.87	10	10.53	2.65	17	26	3.80	.028
Follow directions precisely										
	PO-Block Desigr	**14.53**	3.14	15	11.25	2.77	12	26	4.05	.039

Double check to make sure the task is understood										
	WM-Digit Span	10.57	2.23	21	**11.80**	1.30	5	25	2.49	.043
	WM-Letter Number Seq.	10.50	1.71	16	**14.20**	3.42	5	20	5.40	.043
Do hard sections of test first										
	WM-Index	**124.75**	11.53	4	106.91	9.17	22	25	6.48	.003
Do easy sections of test first										
	WM-Index	103.00	8.82	9	**113.18**	11.21	17	25	2.98	.042
	PO-Matrix Reasoning	13.78	1.39	9	**15.69**	1.11	13	21	8.05	.001
Eliminative/cross out answers that are incorrect										
	PO-Obj. Assem.	**10.27**	1.35	11	8.00	00	2	12	4.34	.027
Take the time to explain reasoning for choosing an answer										
	WM-Letter-Number Seq.	**11.42**	2.71	12	11.33	2.78	9	20	5.48	.041
Go with instinct when answering multiple choice questions										
	PS-Symb. Search	**13.00**	4.00	6	9.78	2.44	18	23	3.68	.024
Circle answers to facilitate review of Scantron for careless errors										
	VC-Index	**137.64**	8.10	14	129.50	12.54	12	25	5.32	.005

Writing Papers										
Write papers one section at a time										
	PS-Index	90.00	10.31	7	**101.06**	13.22	18	24	5.01	.011
	WM-Digit Scale	9.00	1.83	7	**11.47**	1.84	19	25	6.58	.002
Take breaks while writing papers										
	WM-Digit Span	10.00	2.04	14	**11.75**	1.86	12	25	4.39	.008
	VC-Comp.	**16.29**	2.46	14	13.92	2.47	13	26	3.50	.014
Proofread paper by printing it out and marking it up										
	WM-Digit Span	**11.71**	2.05	14	9.75	1.71	12	25	3.31	.020
Proofread by writing and rewriting paper until it is error-free										
	PS-Index	**108.50**	12.08	6	94.63	12.05	19	24	3.54	.036
Time Management										
Have separate to do lists for long term and short term projects										
	PS-Index	**108.13**	12.86	8	93.18	10.75	17	24	4.51	.016
Have separate to do lists for different categories of projects										
	PS-Symb. Search	**12.63**	3.34	8	9.56	2.58	16	23	2.95	.044
Plan free time to increase efficiency										
	WM-Index	103.30	9.42	10	**113.63**	10.92	16	25	3.00	.041

Planning out long term assignments to monitor progress and ensure completion										
	PS-Index	91.75	6.95	4	**99.14**	13.95	21	24	2.74	.074
Develop a timeline for major tests and assignments										
	PS-Symbol Code	**10.22**	2.77	9	8.24	2.17	17	25	2.42	.047
Limit nonacademic commitments during school year										
	WM-Index	103.42	8.72	12	**115.00**	10.88	14	25	4.30	.013
Work Habits										
Plan ahead to take official accommodations										
	PS-Index	93.50	8.98	12	**102.08**	15.48	13	24	5.43	.008
Talk to professors about their Learning Disability										
	WM-Digit Span	**11.69**	2.14	13	9.92	1.75	13	25	2.62	.038
Find strategies to make difficult tasks easier										
	PS-Digit-Symbol	**10.09**	2.63	11	8.07	2.15	15	25	2.46	.045

Note. VC = Verbal Comprehension; WM = Working Memory; PO = Perceptual Organization; PS = Processing Speed; Comp. = Comprehension; Dig-Symb. = Digit-Symbol Coding; Obj. Assem. = Object Assembly; Letter-Number Seq. = Letter Number Sequencing; Symb. Search = Symbol Search.
Note. Seven participants were dropped from all analyses regarding the association between strategy use and cognitive test score due to incomplete questionnaires and/or cognitive scores. One participant was dropped from all analysis regarding total strategy use and select additional strategies due to an incomplete questionnaire.

Appendix

LD Participants' Consent Form

1. CONSENT TO PARTICIPATE IN RESEARCH

CONSENT TO PARTICIPATE IN RESEARCH
Project Title: Academic Strategies
Researcher: Julia Kessler
Faculty Adviser: Lisa Dierker

Introduction:
You are being asked to take part in a research study being conducted by Julia Kessler for a thesis under the supervision of Professor Lisa Dierker in the Department of Psychology at Wesleyan University, Middletown, CT. You have been approached to fill out a questionnaire regarding the strategies you use in your academic studies.

Purpose:
The goal of this project is to document different strategies that are used in the academic environment by learning disabled and non learning disabled students. In addition, this project will explore possible links between the specific strategies used and student's cognitive strengths and weaknesses.

Procedures:
The questionnaire **WILL TAKE APPROXIMATELY 45 MINUTES** to complete. The questionnaire will consist of 8 sections each addressing an area of academic activities (e.g. taking notes, studying for tests, organizing time, etc.). In addition, the questionnaire will ask for demographic information, current GPA, and anticipated major. The questionnaire will seek to record what strategies you use in different areas of academic life and will be completed electronically and submitted via Survey Monkey.

In addition, the documentation of individual disabilities that was submitted to the office of the Dean of the College will be used as a measure of your individual cognitive strengths and weaknesses. Your **CONSENT IS REQUIRED TO GRANT THE RESEARCHER ACCESS TO YOUR OFFICIAL TESTING DOCUMENTATION**. All testing will be kept anonymous and all identifying information will be removed prior to use in this study.

The results of this study will explore what strategies students use, and possible links between chosen strategies and students' specific cognitive strengths and weaknesses.

Risks/Benefits:
The risks associated with participation in this study are minimal.

There are no direct benefits to you from participation, but your willingness to share your knowledge and experiences will contribute to informing the larger community about what types of strategies are successfully used by people with various strengths and weaknesses.

In return for your participation, you will be entered into a **$50 raffle**. Four winners will be picked, each of whom will receive $50. The winners will be contacted after the data collection is complete.

Confidentiality:
Your questionnaire and testing will be kept strictly anonymous. A coding system will be used to link your questionnaire with your testing thereby ensuring that this anonymity is maintained.

Documentation will be stored in locked cabinets in the locked Dierker lab (room 300) in Judd Hall. Questionnaires will be kept in electronic format in a secure computer in a file that will be password protected. Only the researcher, Julia Kessler, and the Faculty Supervisor, Lisa Dierker, will have access to the data. As is APA policy, the data will be kept for five years after any publication of the data, after which time the questionnaire files will be deleted and the documentation will be thrown out. If the data is not published, the data will be kept for five years following the completion of the study, after which the questionnaire files will be deleted and the documentation will be thrown out.

Voluntary Participation:
Your participation in this study is voluntary. Even if you decide to participate, you may withdraw from the study without penalty at any point during the study. You also may choose not to answer specific questions or sections of the questionnaire.

Contacts and Questions:
If you have any questions about this research project, feel free to contact Julia Kessler at Jkessler@wesleyan.edu or the faculty sponsor Professor Lisa Dierker at Ldierker at Ldierker@weslyan.edu. You also may bring complaints about the experiment to Professor Ruth Striegel-Moore, Chair of the Wesleyan Psychology Department, at rstriegel@wesleyan.edu

1. Please type your name bellow
(This information WILL NOT be linked with your survey response in any way.)

2. Statement of Consent:

◯ By selecting this box I am indicating that I am 18 years or older and that I consent to participate in this study
◯ By selecting this box I am indicating that I **DO NOT** consent to participate in this study

NLD Participants' Consent Form

1. CONSENT TO PARTICIPATE IN RESEARCH

CONSENT TO PARTICIPATE IN RESEARCH
Project Title: Academic Strategies
Researcher: Julia Kessler
Faculty Adviser: Lisa Dierker

Introduction:
You are being asked to take part in a research study being conducted by Julia Kessler for a thesis under the supervision of Professor Lisa Dierker in the Department of Psychology at Wesleyan University, Middletown, CT. You have been approached to fill out a questionnaire regarding the strategies you use in your academic studies.

Purpose:
The goal of this project is to document different strategies that are used in the academic environment by learning disabled and non learning disabled students. In addition, this project will explore possible links between the specific strategies used and student's cognitive strengths and weaknesses.

Procedures:
The questionnaire WILL TAKE APPROXIMATELY 45 MINUTES to complete. The questionnaire will consist of 8 sections each addressing an area of academic activities (e.g. taking notes, studying for tests, organizing time, etc.). In addition, the questionnaire will ask for demographic information, current GPA, and anticipated major. The questionnaire will seek to record what strategies you use in different areas of academic life and will be completed electronically and submitted via Survey Monkey.

The results of this study will explore what strategies students use, and possible links between chosen strategies and students' specific cognitive strengths and weaknesses.

Risks/Benefits:
The risks associated with participation in this study are minimal.

There are no direct benefits to you from participation, but your willingness to share your knowledge and experiences will contribute to informing the larger community about what types of strategies are successfully used by people with various strengths and weaknesses.

In return for your participation, you will be entered into a $50 raffle. Four winners will be picked, each of whom will receive $50. The winners will be contacted after the data collection is complete.

Confidentiality:
Your questionnaire will be kept strictly anonymous.

Questionnaires will be kept in electronic format in a secure computer in a file that will be password protected. Only the researcher, Julia Kessler, and the Faculty Supervisor, Lisa Dierker, will have access to the data. As is APA policy, the data will be kept for five years after any publication of the data, after which time the questionnaire files will be deleted. If the data is not published, the data will be kept for five years following the completion of the study, after which the questionnaire files will be deleted.

Voluntary Participation:
Your participation in this study is voluntary. Even if you decide to participate, you may withdraw from the study without penalty at any point during the study. You also may choose not to answer specific questions or sections of the questionnaire.

Contacts and Questions:
If you have any questions about this research project, feel free to contact Julia Kessler at Jkessler@wesleyan.edu or the faculty sponsor Professor Lisa Dierker at Ldierker at Ldierker@weslyan.edu. You also may bring complaints about the experiment to Professor Ruth Striegel-Moore, Chair of the Wesleyan Psychology Department, at rstriegel@wesleyan.edu.

1. Please type your name bellow
(This information WILL NOT be linked with your survey response in any way.)

2. Statement of Consent:

◯ By selecting this box I am indicating that I am 18 years or older and that I consent to participate in this study
◯ By selecting this box I am indicating that I **DO NOT** consent to participate in this study

Academic Strategies Questionnaire

1. Consent

CONSENT TO PARTICIPATE IN RESEARCH

Due to the efforts to maintain anonymity, it is necessary to request that you report your own consent status. If you did not consent to participate in this study, you will be redirected to the debriefing page. Please excuse the repetition.

1. Please indicate if you did or did not consent to participate in this study.

◯ By selecting this box I am indicating that I am 18 years or older and that I did consent to participate in this study

◯ By selecting this box I am indicating that I **DID NOT** consent to participate in this study

2. SURVEY CODE

1. In the space provided please enter your date of birth (format MM/DD/YYYY) and the last two digits of your Wesleyan ID (format -##).

E.g. 04/27/1986-24

3. DEMOGRAPHIC AND BACKGROUND INFORMATION

1. Sex

◯ Male

◯ Female

2. Race/Ethnicity (Please choose all that apply)

☐ White

☐ Black

☐ Hispanic, Latino, or Spanish Origin

☐ American Indian, Eskimo, or Aleut

☐ Asian or Pacific Islander

Other (Please specify below)

3. Date of Birth (MM/DD/YYYY)

4. Class Year

5. GPA

6. Major(s) or Anticipated Major(s)

7. Approximate hours per week spent doing extra curricular activities and/or working a job

8. Are you on financial aid?

◯ Yes

◯ No

Other (Please specify below)

4. IN-CLASS NOTE TAKING

The goal of this section is to determine **what strategies you use, in general, while TAKING IN-CLASS NOTES**. Below is a comprehensive list of strategies that you may use to accomplish the different tasks involved in taking in-class noes. Please read the list and **CHECK OFF ALL OF THE STRATEGIES THAT YOU USE** while taking in-class notes. If you feel that your use of any of the strategies needs clarification, please feel free to elaborate or clarify in any way in the text box provided. In addition, if a strategy that you use is not listed please describe the strategy in the text box provided.

1. What method(s) do you use to physically record notes in class?

	Please check all that apply	Clarification Below
Handwrite notes	☐	☐
Tape-record notes (i.e. you tape record the lecture)	☐	☐
Type notes (i.e. you use a word processor)	☐	☐
Use electronic pad (i.e. computerized notes using electronic pads)	☐	☐
Take notes on a copy of the professor's lecture notes or slides	☐	☐
None (I do not record notes in class)	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

2. If you don't take notes during a lecture, what do you do?

	Please check all that apply	Clarification Needed
Nothing (i.e. solely listen to lectures and don't take any notes)	☐	☐
Use a copy of a classmate's notes	☐	☐
Use a copy of the professor's notes/slides	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

3. If you take notes, how do you do it?

	Please check all that apply	Clarification Needed
Take notes in class and then supplement/compare your notes with classmate's or professor's notes (either shortly after class or just before a test)	☐	☐
Transcribe lecture nearly word-for-word	☐	☐
Use standard outline method (i.e. roman numerals or bullet points and indentations)	☐	☐
Use trees or diagrams to demonstrate relationships	☐	☐
Take notes from tape recording of lecture after lecture	☐	☐
Take notes from transcribed notes after lecture	☐	☐
Use symbols or abbreviations to speed up note-taking	☐	☐
Write quickly and leave gaps if you fall behind (please indicate how and when you fill in the gaps, e.g. friend's notes, text book, TA, tape recording etc.)	☐	☐
Use standardized note-taking strategies	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

4. If you take notes, how do you keep them organized?

	Please check all that apply	Clarification Needed
Label notes with date and/or topic	☐	☐
Store typed or scanned notes in computer (i.e. have a file for each class or other similar methods)	☐	☐
Use file cabinets for written notes, printed notes, and tapes	☐	☐
Use binders and folders for handwritten notes, printed typed notes, etc.	☐	☐
Use notebooks without looseleaf paper	☐	☐
Use folders or portable file-binders	☐	☐
Label tape-recorded notes with class name and date	☐	☐
Set tape recorder counter to zero and mark time for notes	☐	☐
Color code all materials (book covers, notebooks, folders, etc.)	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

5. PREPARING FOR LECTURES

The goal of this section is to determine **what strategies you use, in general, to PREPARE FOR LECTURES**. Below is a comprehensive list of strategies that you may use to prepare for lectures. Please read the list and **CHECK OFF ALL OF THE STRATEGIES THAT YOU USE** to prepare for lectures. If you feel that your use of any of the strategies needs clarification, please feel free to elaborate or clarify in any way in the text box provided. In addition, if a strategy that you use is not listed, please describe the strategy in the text box provided.

1. What do you do to prepare for lectures?

	Please check all that apply	Clarification Needed
Nothing (just go to the lecture)	☐	☐
Do the reading before class (associate the lecture with the reading as you listen)	☐	☐
Do the reading after class(associate the reading with the lecture)	☐	☐
Preview new material and review old material (e.g. previous lectures)before each class	☐	☐
Choose preferential seating (please explain where and why, e.g. you sit in the front so that you get noticed or can see better)	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

6. DOING HOMEWORK

The goal of this section is to determine **what strategies you use, in general, while doing various types of HOMEWORK**. Below is a comprehensive list of strategies that you may use to accomplish the various types of homework. Please read the list and **CHECK OFF ALL OF THE STRATEGIES THAT YOU USE** while completing each type of homework. If you feel that your use of any of the strategies needs clarification, please feel free to elaborate or clarify in any way in the text box provided. In addition, if a strategy that you use is not listed, please describe the strategy in the text box provided.

1. What do you do when completing problem sets and other similar assignments (e.g. lab reports, etc.)?

	Please check all that apply	Clarification Needed
Write questions in your own words, rephrase questions out loud, or explain questions to someone else	☐	☐
Draw out questions	☐	☐
Make tables or lists	☐	☐
Circle/underline signs (e.g. +/-) and important signal words (e.g. "not", "other than")	☐	☐
Cross out information that is not important	☐	☐
Set up formulas and logic first	☐	☐
Estimate before working out solution	☐	☐
Use a calculator	☐	☐
Work slowly and monitor for errors in operations or careless mistakes (spend extra time (e.g. more than is strictly necessary or more than most students do))	☐	☐
Do work for questions multiple times to check math	☐	☐
Guess and check	☐	☐
Work backwards	☐	☐
Make an easier version of the problem in the same style as the one assigned	☐	☐
Look for patterns	☐	☐
Check all of your answers	☐	☐
Make sure there are labels or units	☐	☐
Explain (to yourself or to others) why your answer makes sense	☐	☐
Work with other classmates	☐	☐
Go to TA sessions	☐	☐
Start early	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

2. What do you do while reading textbook chapters, articles and other academic texts?

	Please check all that apply	Clarification Needed
Read chapter descriptions, summaries, introductions and/or abstracts before reading the text	☐	☐
Read headings before reading text	☐	☐
Survey reading before starting	☐	☐
Verbalize what you read	☐	☐
Take notes	☐	☐
Paraphrase important/main ideas or individual sections	☐	☐
Tape comments and study from the tape	☐	☐
Color code or mark the text with colors/symbols for the main ideas and supporting ideas	☐	☐
Highlight or underline *important parts of the reading*	☐	☐
Highlight or underline *parts of the reading that you want to go back to* (e.g. things that should be re-read before the test)	☐	☐
Make hierarchical outline of the whole chapter or of parts of the chapter (e.g. difficult sections)	☐	☐
Take notes in margins of the text to *mark where important information is located*	☐	☐
Take notes in margins of the text to *summarize the section or explain points in your own words*	☐	☐
Take notes in margins of the text to *make connections between different points*	☐	☐
Use drawings or diagrams to demonstrate relationships	☐	☐
Read and re-read until text is understood	☐	☐
Read slowly to ensure comprehension	☐	☐
Try to find the most important ideas in the reading	☐	☐
Make focus questions for readings and look for the answers as you read	☐	☐
Listen to all or parts of the readings on tape	☐	☐
Read summaries at the end of the reading	☐	☐
Ask yourself test questions at the end of the reading	☐	☐
Think about the larger context and try to place the reading within the context of the rest of the classwork	☐	☐
Relate reading to the material that you already know through mental review, written description, oral explanation, outlines, diagrams, etc.	☐	☐
Change the way you are reading the material if you are having difficultly	☐	☐
Read all textbook features (charts, boxes, graphs, etc.)	☐	☐
Break reading up into reasonable segments	☐	☐
Do reading before the lectures	☐	☐
Do reading after the lectures	☐	☐
Keep up with weekly readings	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

3. What do you do while reading stories and narratives?

	Please check all that apply	Clarification Needed
Create mental images to describe scenes	☐	☐
Create a list of characters and their relationships to us as a reference as you read	☐	☐
Summarize plot and/or important themes	☐	☐
Verbalize what you read	☐	☐
Take notes	☐	☐
Highlight or underline *important parts of the reading*	☐	☐
Highlight or underline *parts of the reading that you want to go back to* (e.g. things that should be re-read before the test)	☐	☐
Take notes in margins of the text to *mark where important information is located*	☐	☐
Take notes in margins of the text to *summarize the section or explain points in your own words*	☐	☐
Take notes in margins of the text to *make connections between different points*	☐	☐
Use drawings or diagrams to demonstrate relationships	☐	☐
Read and re-read until text is understood	☐	☐
Read slowly to ensure comprehension	☐	☐
Make focus questions for readings and look for the answers as you read	☐	☐
Listen to all or parts of the readings on tape	☐	☐
Ask yourself test questions at the end of the reading	☐	☐
Think about the larger context and try to place the reading within context of previous readings	☐	☐
Relate the story or narrative to other readings through mental review, written description, oral explanation, outlines, diagrams, etc.	☐	☐
Change the way you are reading the material if you are having difficultly	☐	☐
Break reading up into reasonable segments	☐	☐
Do the reading before the lectures	☐	☐
Do the reading after the lectures	☐	☐
Keep up with weekly readings	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

7. STUDYING FOR EXAMS

The goal of this section is to determine **what strategies you use, in general, while STUDYING FOR EXAMS**. Below is a comprehensive list of strategies that you may use to accomplish the different tasks involved in studying for exams. Please read the list and **CHECK OFF ALL OF THE STRATEGIES THAT YOU USE** while studying for exams. If you feel that your use of any of the strategies needs clarification, please feel free to elaborate or clarify in any way in the text box provided. In addition, if a strategy that you use is not listed, please describe the strategy in the text box provided.

1. If you use outlines and notes to study, which of the following do you do?

	Please check all that apply	Clarification Needed
Copy notes over to make them neater or more organized (e.g. reorganize, clarify, or expand notes)	☐	☐
Take notes from transcribed or recorded lectures	☐	☐
Re-write notes verbatim	☐	☐
Color code, underline or highlight notes	☐	☐
Enlarge notes	☐	☐
Make exhaustive outline (one that has all available information on the topic)	☐	☐
Put together information from different sources (e.g. lectures, reading, discussions)	☐	☐
Use outline to gather and organize information on important concepts	☐	☐
Make lists of important concepts	☐	☐
Make simple charts, sketches, diagrams, tables, graphs, etc. to organize course materials	☐	☐
Categorize and separate information into groups or units	☐	☐
Outline chapters in textbooks (i.e. map text or use hierarchical outline)	☐	☐
Re-read all or parts of the assigned readings	☐	☐
Read textbook for the first time before the test (please indicate in the "Reading" section of the questionnaire all strategies that you use to read the textbook)	☐	☐
Read over notes and outlines	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

2. If you use key points and summaries to learn material, which of the following do you do?

	Please check all that apply	Clarification Needed
Highlight the main points from reading and class notes	☐	☐
Summarize, paraphrase, re-write or explain main ideas to a friend or to yourself (i.e. put important ideas in your own words)	☐	☐
Make outline of key concepts	☐	☐
Make list of key concepts	☐	☐
Keep a glossary of important terms, key concepts, major events, theories or formulas, etc.	☐	☐
Identify key points while reading to make review easier	☐	☐
Make visual explanations of main ideas and important concepts (e.g. graphs, highlighting, tables, etc.)	☐	☐
Write examples	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

3. If you use tapes and audio notes to learn material, which of the following do you do?

	Please check all that apply	Clarification Needed
Listen to recorded lectures	☐	☐
Take notes from recorded lectures	☐	☐
Read aloud and record notes/textbook	☐	☐
Listen to recorded notes/textbook as you read	☐	☐
Listen to recorded notes/textbook without reading	☐	☐
Take notes from recorded readings	☐	☐
Listen to tape recorded lectures while doing daily activities (e.g. while driving, exercising, eating, etc.)	☐	☐
Listen to recorded vocabulary words	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

4. What strategies do you use to memorize material?

	Please check all that apply	Clarification Needed
Get/create and take practice exams and questions (e.g. end of chapter questions)	☐	☐
Rehearse materials through repetition of important facts (e.g. oral, auditory, or written repetition)	☐	☐
Use flash cards	☐	☐
Use rhymes (e.g. to remember the order of operations in math)	☐	☐
Use first letter mnemonics and acronyms and associations	☐	☐
Create paired associations	☐	☐
Use visual imagery, visual images, imagining various associations, etc.	☐	☐
Use unwritten tricks (e.g. singing, changing a text, etc.)	☐	☐
Memorize lists	☐	☐
Use cues or key words (e.g. memorize words that remind you of important concepts in the class)	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

5. When you study how do you think about the material?

	Please check all that apply	Clarification Needed
I try to think about what I'm supposed to learn from material rather than just reading the material over	☐	☐
I relate the new material to material I already know	☐	☐
I try to make the material all fit together (i.e. I try to apply and connect all different aspects of class: reading, lectures, homework, and discussion)	☐	☐
I relate course content to my own experience	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

6. Do you use any of the following study methods?

	Please check all that apply	Clarification Needed
Ask the professor or TA what material they think is most important or how they think you should study	☐	☐
Determine which concepts you do not fully understand and target those by looking up information on the concepts in the textbook or in other sources	☐	☐
Determine which concepts you do not fully understand and have a classmate, TA, professor, or tutor help you master them	☐	☐
Study with a private tutor	☐	☐
Get help from people with experience in the subject (classmates, friends, TA, family members, etc.)	☐	☐
Go to study groups (please describe any methods that you use to learn from study groups, e.g. studying before arriving, bringing questions with you, bringing an outline, taking notes on the discussion, writing down others' questions)	☐	☐
Find out the format of the test and make sure that you can answer the types of questions that will be asked (e.g. if the questions are going to be fill-in-the-blank instead of multiple choice make sure you are prepared for that type of question)	☐	☐
Try to anticipate essay questions	☐	☐
Review material frequently and regularly throughout the semester	☐	☐
Review material after or before each class	☐	☐
For cumulative tests: study what you got wrong on previous tests	☐	☐
For cumulative tests: read all previous outlines	☐	☐
For cumulative tests: redo all previous outlines or make new outlines	☐	☐
For cumulative tests: highlight and mark up all previous outlines	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

7. Which of the study habits do you have?

	Please check all that apply	Clarification Needed
You study efficiently (you don't get bored or distracted and stop)	☐	☐
You gather and organize all materials before starting a study session	☐	☐
You put in extra time to study (i.e. more than is strictly necessary or more than most students do)	☐	☐
You organize and plan your learning strategy before beginning to study	☐	☐
You select important facts, concepts, and details to review (stepwise processing)	☐	☐
You study in a place where you can concentrate well	☐	☐
You study in one regular place	☐	☐
You take lots of breaks while you study	☐	☐
You study in long sittings	☐	☐
You listen to background music while you study	☐	☐
You make a study schedule	☐	☐
You use short term goals and break your studying down into segments	☐	☐
You set study goals for each study period	☐	☐
You try to anticipate questions	☐	☐
You pick study strategies that will help you rely on your stronger skills (e.g. visual strategies verses written ones)	☐	☐
You become energized or tense	☐	☐
You stay calm	☐	☐
You review material on the evening before a test	☐	☐
You review material on the morning before a test	☐	☐
You study the hard material first	☐	☐
You study the easy material first	☐	☐
You get enough sleep, have enough food, etc. on the day of the test	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

8. TEST TAKING

The goal of this section is to determine **what strategies you use, in general, while TAKING TESTS**. Below is a comprehensive list of strategies that you may use to accomplish the different tasks involved in taking tests. Please read the list and **CHECK OFF ALL OF THE STRATEGIES THAT YOU USE** while taking tests. If you feel that your use of any of the strategies needs clarification, please feel free to elaborate or clarify in any way in the text box provided. In addition, if a strategy that you use is not listed, please describe the strategy in the text box provided.

1. What official accommodations do you use while taking tests?

	Please check all that apply	Clarification Needed
Separate testing location	☐	☐
Additional rest breaks during tests	☐	☐
Extended time on tests	☐	☐
Leniency with assignment deadlines	☐	☐
Early receipt of assignments	☐	☐
Advanced notice for all quizzes and exams (i.e. no pop quizzes)	☐	☐
Use of a calculator for exams and in-class work where calculation is non-essential	☐	☐
Leniency on spelling and grammar where spelling and grammar is non-essential	☐	☐
Use of word processor	☐	☐
Test reader (i.e. you have tests read to you)	☐	☐
Test recorder/writer (i.e. someone records your responses for you)	☐	☐
Use color film to put over text for reading	☐	☐
Other alternative test format (e.g. large print sheet, oral responses instead of written, etc.) (Please specify below)	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

2. What overall strategies do you use while taking tests?

	Please check all that apply	Clarification Needed
You make lists of things that you have memorized on the side of your test as soon as you begin (e.g. facts, dates, formulas, etc.)	☐	☐
You read test directions carefully	☐	☐
You underline/circle important signal words (e.g. not, contrast, although) in directions	☐	☐
You underline/circle tasks or description of tasks in instructions	☐	☐
You follow directions precisely	☐	☐
You check back to make sure directions have been followed precisely	☐	☐
You pace yourself and allot time/priority to each section of test	☐	☐
You use all of your time	☐	☐
You go over questionable/difficult items a second time	☐	☐
You check your answers	☐	☐
You read the whole test over before starting	☐	☐
You complete the hard sections first	☐	☐
You complete the easy sections first	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

3. What strategies do you use while answering multiple choice, true/false, or fill-in-the-blank questions?

	Please check all that apply	Clarification Needed
Circle/underline key words in questions (e.g. "not," "other than," etc.)	☐	☐
You summarize/reword all or some of the questions to yourself or to a proctor to make sure you understand them	☐	☐
You eliminate answers that are incorrect (e.g. cross them out, list them, etc.)	☐	☐
You read questions and go with instinct	☐	☐
You write out or think about your logic for choosing or not choosing an answer (i.e. you write out or think about your train of thought)	☐	☐
You answer the easiest questions first and go back to hard ones at the end	☐	☐
You circle questions that you have difficulty with and spend extra time on them at the end	☐	☐
You circle answers on test itself and on the answer sheet so that you can double check for careless errors	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

4. What strategies do you use while doing an essay section of a test?

	Please check all that apply	Clarification Needed
You underline key parts of the essay question	☐	☐
You double check that you understand what the task is	☐	☐
You circle important signal words in the essay question (e.g. "not," "contrast," "similar." etc.)	☐	☐
You summarize/reword/rephrase the essay question to yourself or to a proctor to make sure you understand it	☐	☐
You brainstorm or make an outline with everything you can think of that is relevant before you start writing	☐	☐
You use an outline to organize your thoughts	☐	☐
You proofread by *using a word processor to check spelling and grammar*	☐	☐
You proofread by *reading over your paper to check for coherency*	☐	☐
You proofread by reading over your paper to check for *strength of argument*	☐	☐
You proofread by reading over your paper to check for *organization and strength of structure*	☐	☐
You proofread by reading over your paper to check for *spelling and grammar*	☐	☐
You proofread your paper in steps (e.g. first read for end punctuation, then again for capitalization, then for coherency, etc.)	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

9. TAKE-HOME TESTS AND ASSIGNMENTS

The goal of this section is to determine **what strategies you use, in general, DOING TAKE-HOME TESTS AND ASSIGNMENTS**. Below is a comprehensive list of strategies that you may use to accomplish the different tasks involved in doing take-home tests and assignments. Please read the list and **CHECK OFF ALL OF THE STRATEGIES THAT YOU USE** while doing take-home tests and assignments. If you feel that your use of any of the strategies needs clarification, please feel free to elaborate or clarify in any way in the text box provided. In addition, if a strategy that you use is not listed, please describe the strategy in the text box provided.

1. Do you use the same strategies to study for take-home tests that you use for in-class tests?

◯ Yes

◯ No (Please specify below)

If you don't use the same strategies for take-home tests that you use for in-class tests, please so indicate and describe the stratgies use for take-home tests

2. Do you use the same strategies to take take-home tests that you use to take in-class tests?

◯ Yes

◯ No (Please specify below)

If you don't use the same strategies for take-home tests that you use for in-class tests, please so indicate and describe the stratgies use for take-home tests

3. What strategies do you use to write papers?

	Please check all that apply	Clarification Needed
You underline key parts of the question	☐	☐
You double check that you understand what the task is	☐	☐
You circle important signal words in the essay question (e.g. "not," "contrast," "similar")	☐	☐
You summarize/reword/rephrase the question to yourself or to a proctor to make sure you understand the question	☐	☐
You brainstorm everything you can think of that is relevant before you start writing	☐	☐
You use an outline to guide your writing	☐	☐
You read course readings and/or lectures for quotes or ideas	☐	☐
You use an outline to organize your thoughts	☐	☐
You continually flush out sections or outlines until your rough draft is basically written	☐	☐
You write your paper one section at a time	☐	☐
You write your paper from start to finish in order (e.g. introduction through conclusion)	☐	☐
You outline each section or paragraph to make sure the composition is solid (e.g. topic sentences, support for thesis, etc.)	☐	☐
You record yourself speaking your paper or your ideas out loud and then write them down from the tape	☐	☐
You take breaks in the writing process	☐	☐
You write your paper in one sitting	☐	☐
You proofread by *using a word processor to check spelling and grammar*	☐	☐
You proofread by *reading your paper aloud*	☐	☐
You proofread by *printing your paper and marking it up*	☐	☐
You proofread by *writing and re-writing your paper until it is error-free*	☐	☐
You proofread by *reading over your paper to check for coherency*	☐	☐
You proofread by reading over your paper to check for *strength of argument*	☐	☐
You proofread by reading over your paper to check for *organization and strength of structure*	☐	☐
You proofread by reading over your paper to check for *spelling and grammar*	☐	☐
You proofread your paper in steps (e.g. first read for end punctuation, then again for capitalization, then for coherency, etc.)	☐	☐
You proofread by having *a friend, writing tutor, classmate, etc. read over your paper*	☐	☐
You proofread by having *a checklist to monitor troublesome punctuation, capitalization, grammar, etc.*	☐	☐
You proofread by having *a personal list of difficult words to check for correct spelling*	☐	☐
You use easier words to improve spelling	☐	☐
You write simpler sentences to improve grammar	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

10. OVERALL WORK HABITS

The goal of this section is to determine **what, in general, your overall strategies are**. Below is a comprehensive list of strategies that you may use to organize your time, stay on top of your course load, and have good work habits. Please read the lists and **CHECK OFF ALL OF THE STRATEGIES THAT YOU USE**. If you feel that your use of any of the strategies needs clarification, please feel free to elaborate or clarify in any way in the text box provided. In addition, if a strategy that you use is not listed, please describe the strategy in the text box provided.

1. What time management strategies do you use to organize your time?

	Please check all that apply	Clarification Needed
Use a calendar that has daily assignments, exams, social events, important appointments, long range assignments, etc.	☐	☐
Put everything on a calendar so you don't have to depend on your memory	☐	☐
Use "to do" lists	☐	☐
Have separate long term and short term "to do" lists	☐	☐
Have separate categories of "to do" lists	☐	☐
Plan out your daily/weekly free time to increase efficiency	☐	☐
Use a planner for specific tasks (e.g. daily homework)	☐	☐
Work backwards from the due date on long range assignments to build in enough time and keep tabs on your progress	☐	☐
Develop a time line for major assignments and tests	☐	☐
Break assignments into manageable parts	☐	☐
Schedule regular times to study on a weekly basis	☐	☐
Carry a copy of your schedule with you	☐	☐
Carry a calendar to schedule meetings and appointments	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

2. What strategies do you use to manage your course load?

	Please check all that apply	clarification Needed
Make sure that your classwork is balanced (e.g. make sure that you don't have too many reading intensive classes)	☐	☐
Take fewer hard course	☐	☐
Take fewer course in areas in which you have difficultly	☐	☐
Limit your nonacademic commitments (e.g. have jobs only during the summer)	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

3. What work habits do you use?

	Please check all that apply	Clarification Needed
Plan ahead (i.e. making arrangements, talking to professors, clearing your schedule, etc.) to take official accommodations (e.g. separate location, extra time, etc.)	☐	☐
Go to all of your classes	☐	☐
Stay focused in class, on homework, on tests	☐	☐
Set goals and rewards	☐	☐
Talk to professors about your disabilities	☐	☐
Improve basic skills (e.g. grammar, math, spelling, writing, etc.)	☐	☐
Use tutors	☐	☐
Use institution's support resources	☐	☐
Find strategies to make difficult things easier	☐	☐
Invest necessary time and effort into school work	☐	☐
Set educational goals and subgoals	☐	☐
Spend extra time on academic work and exams	☐	☐
Other (Please specify below)	☐	☐

Text Box: 1) Clarification/Elaboration of your use of strategies 2) Description of additional strategies that you use

11. Debriefing

Thank you for participating in this study!

After reaching this page, please do not reenter the survey or change any of your responses.

If you participated in this study, you reported which strategies you use to accomplish a variety of academic tasks. The goals of this study are to explore what strategies learning disabled students use to accommodate for their learning disabilities and to see if the specific strategies used are correlated with the student's specific cognitive strengths and weaknesses. In addition, this study will explore the possibility that students with and without learning disabilities will use different academic strategies.

In recent years, there has been much research into the success achieved by learning disabled students in higher education. Though none of the studies have been conclusive, it has been suggested that learning disabled students are more reliant on the use of strategies than students without learning disabilities. In addition, some researchers have discovered evidence that suggests that learning disabled students use different strategies than students without learning disabilities. For example, learning disabled students seem to prefer unwritten tricks and strategies such as diagrams and trees more than students without learning disabilities. If you are interested in learning more, please reference the suggested readings listed below.

In addition, if you are interested in learning more about the findings of the study in which you just participated, please contact the researcher, Julia Kessler, at jkessler@wesleyan.edu.

Suggested readings:

Heiman, T., & Precel, K. (2003). Students with learning disabilities in higher education: academic strategies profile. Journal of Learning Disabilities, 36 (3), 248-258.

Trainin, G., & Swanson, H. L., (2005). Cognition, metacognition, and achievement of college students with learning disabilities. Learning Disability Quarterly, 28(4), 261.